Prepared For

Alexandria Regional ITS Architecture

Prepared By

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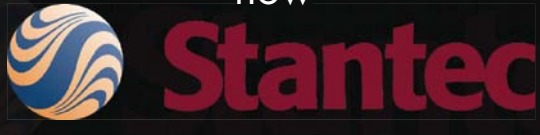

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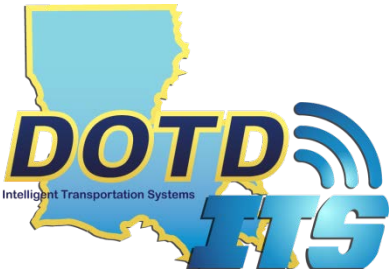
ITS ARCHITECTURE (NEW AND UPDATES)

ALEXANDRIA REGIONAL ITS ARCHITECTURE

Presented to:



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1 Introduction

This document describes the Intelligent Transportation System (ITS) architecture for the Alexandria region. A Regional ITS Architecture is "a regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects." Paragraph 940.9 (a) states that:

> "A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans. The National ITS Architecture shall be used as a resource in the development of the regional ITS architecture. The regional ITS architecture shall be on a scale commensurate with the scope of ITS investment in the region. Provision should be made to include participation from the following agencies, as appropriate, in the development of the regional ITS architecture: highway agencies; public safety agencies (e.g., police, fire, emergency/medical); transit operators; Federal lands agencies; State motor carrier agencies; and other operating agencies necessary to fully address regional ITS integration."

This architecture conforms to Federal Highway Administration (FHWA) Final rule 940 Part 11, which mandates that projects planning to use federal funds in their ITS deployments must have established an ITS Architecture for the region. Regional ITS Architectures have been promoted by the United States Department of Transportation (USDOT) as descriptive tools, using a standard vocabulary and set of concepts for regional deployments in order to aid the integration of User Services and Service packages in addressing regional transportation problems. Regional ITS Architectures are also used to constrain projects, funded by the FHWA using high technology products, to highway or transit applications.

1.1 Background

What are Intelligent Transportation Systems or ITS? Simply put, they are the application of technology to highway or transit applications. The formal description states:

> "ITS improves transportation safety and mobility and enhances productivity through the use of advanced information and communication technologies. Intelligent transportation systems (ITS) encompass a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and enhance American productivity."

To effectively apply ITS to highway and transit projects, the National ITS Architecture, initiated in 1991 and sponsored by USDOT, describes a wide range of likely ITS applications, using high technology products, for highway and transit projects. In 2001 the FHWA and Federal Transit Administration (FTA) established 23 Code of Federal Regulations (CFR) 940 Part 11, which required agencies using federal funds to establish ITS Architectures for their regions. The architecture must contain the following elements:

1) Description of the region – **Section 3**
2) Identification of the participating agencies and other stakeholders – **Section 5**
3) Roles and responsibilities of the participating agencies and other stakeholders – **Section 9**
4) Agreements needed for operation – **Section 13**
5) System functional requirements – **Section 11**
6) Interface requirements and information exchanges with planned and existing systems – **Appendix B** (*also see* the Alexandria Regional ITS Architecture Turbo Architecture source file)
7) Identification of applicable standards (ITS Standards) – **Section 12**

8) Sequence of projects necessary for implementation traceable to a portion of the regional architecture – **Section 9**

The products derived from architecture development processes provide a number of benefits to the transportation planners and engineers. The following are examples of these benefits:

1) Establishes a common terminology for the various ITS elements needed to implement and operate ITS applications.
2) Defines those elements and the functions they perform, and identifies, in theory, all of the possible interrelationships among the ITS elements.
3) The National ITS Architecture does not dictate a specific approach to implementing or operating any ITS application; rather, it provides a common set of terms and concepts that local ITS implementers are encouraged to utilize in describing their specific ITS activities.
4) Provides a "living" planning document that promotes modularity and integration, and minimizes impacts when needs to regional issues change.
5) Promotes a thorough, coordinated and multi-jurisdictional "systems" approach to ITS and the use of a Systems Engineering process to its deployment.
6) Fosters the utilization of the "standards" that are being developed through the USDOT National ITS Architecture program.

2 Acronyms and Abbreviations

ASC – Actuated Traffic Signal Controller
ATIS – Advanced Traveler Information System
ATMS – Advanced Traffic Management System
ATRANS – Alexandria Transit
AVL – Automated Vehicle Location
CAD – Computer Aided Dispatch
CCTV – Closed Circuit Television
CFR – Code of Federal Regulations
CMU – Conflict Monitor Units
DCM – Data Collection and Monitoring
DMS – Dynamic Message Signs
DOTD – Department of Transportation and Development
FHWA – Federal Highway Administration
FMS – Field Management Stations
FTA – Federal Transit Administration
HAR – Highway Advisory Radio
HRI – High-rail Intersection
ITS – Intelligent Transportation Systems
LADOTD – Louisiana Department of Transportation and Development
LSP – Louisiana State Police
MAP – Motorist Assistance Patrol
MPO – Metropolitan Planning Organization
MTP – Metropolitan Transportation Plan
MS/ETMCC – Message Sets for External Traffic Management Center Communications
NTCIP – National Transportation Communications for Intelligent Transportation System Protocol
O & M – Operations and Maintenance
OHSEP – Office of Homeland Security and Emergency Preparedness
PCMS – Portable Changeable Message Signs
PDA – Personal Digital Assistant
RAPC – Rapides Area Planning Commission
RR – Roles and Responsibilities
SCP – Signal Control and Prioritization
SDO – Standards Development Organizations
SSM – Signal System Master
SSL – Signal System Local
TDM – Travel Demand Management
TIM – Traffic Incident Management
TIP – Transportation Improvement Program
TMC – Traffic Management Center
TMDD – Traffic Management Data Dictionary
TSS – Transportation Sensor Systems
USDOT – United States Department of Transportation
XML – Extensive Markup Language
VHT – Vehicle Hours Traveled
VMT – Vehicle Miles Traveled

3 Architecture Scope

The Alexandria Regional ITS Architecture is a roadmap for transportation systems integration. The architecture was developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. It represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region.

The architecture provides an overarching framework that spans all of the region's transportation organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. This chapter establishes the scope of the architecture in terms of its geographic breadth, the scope of services that are covered, and the time horizon that is addressed.

3.1 Timeframe

The time frame for this Architecture is five years.

3.2 Geographic Scope

The region for which this ITS Architecture is being developed corresponds with the urbanized area under the jurisdiction of the Rapides Area Planning Commission (RAPC). The Metropolitan Planning Organization (MPO) housed within RAPC provides transportation planning for the urbanized area of Rapides Parish.

3.3 Service Scope

This Regional ITS Architecture covers a range of ITS services intended to address transportation needs identified within the defined geographic scope. These transportation deficiencies in the region may be existing or emerging transportation issues. Various services based on the national ITS architecture service packages shall be selected and programmed into projects to address the transportation needs in a logical manner. **Section 7** of this document shows a range of existing and planned ITS services.

3.4 Maintainer

Louisiana Department of Transportation and Development (LADOTD), with the assistance of RAPC will maintain the Alexandria Regional ITS Architecture.

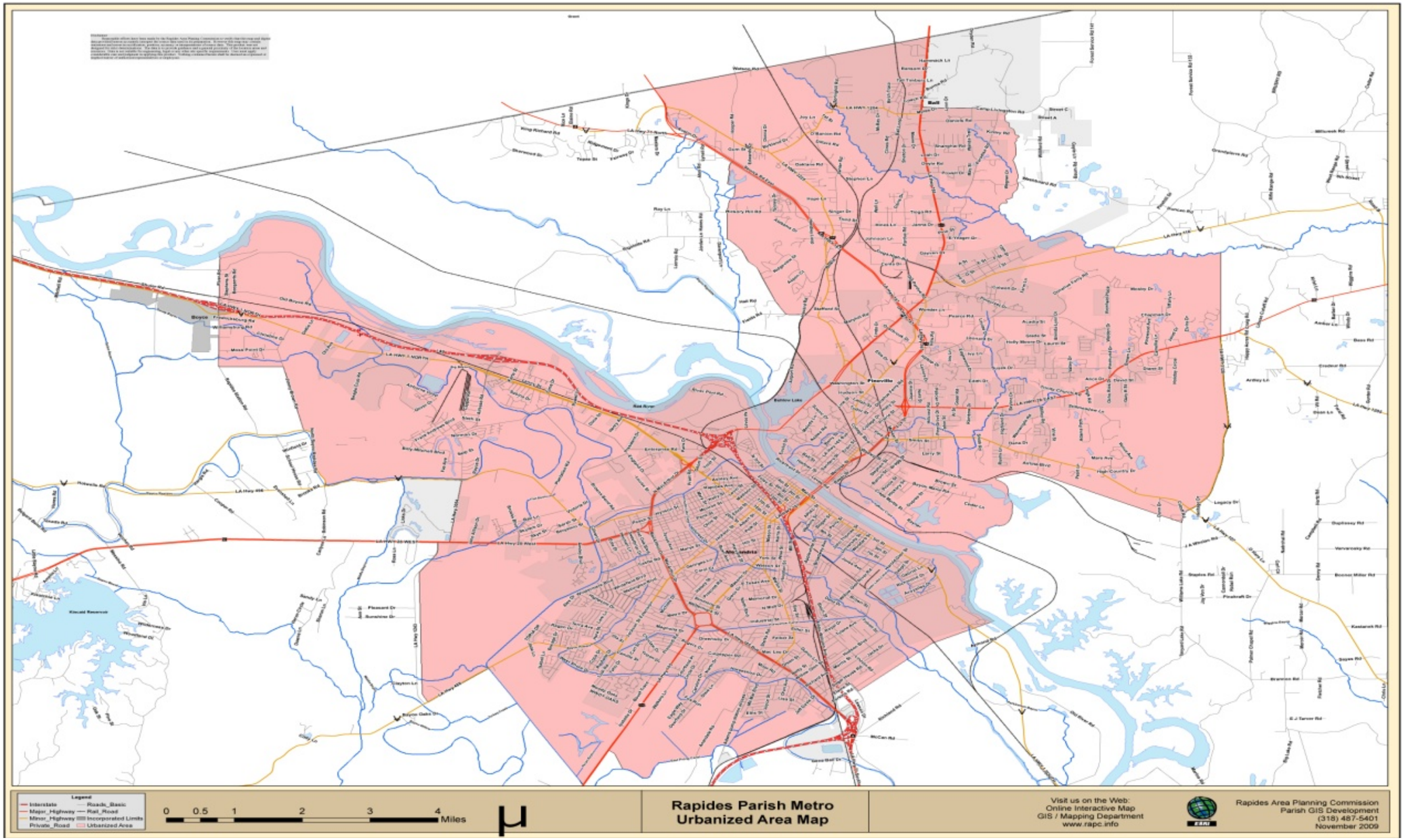

Figure 1: Alexandria Regional ITS Architecture Boundary

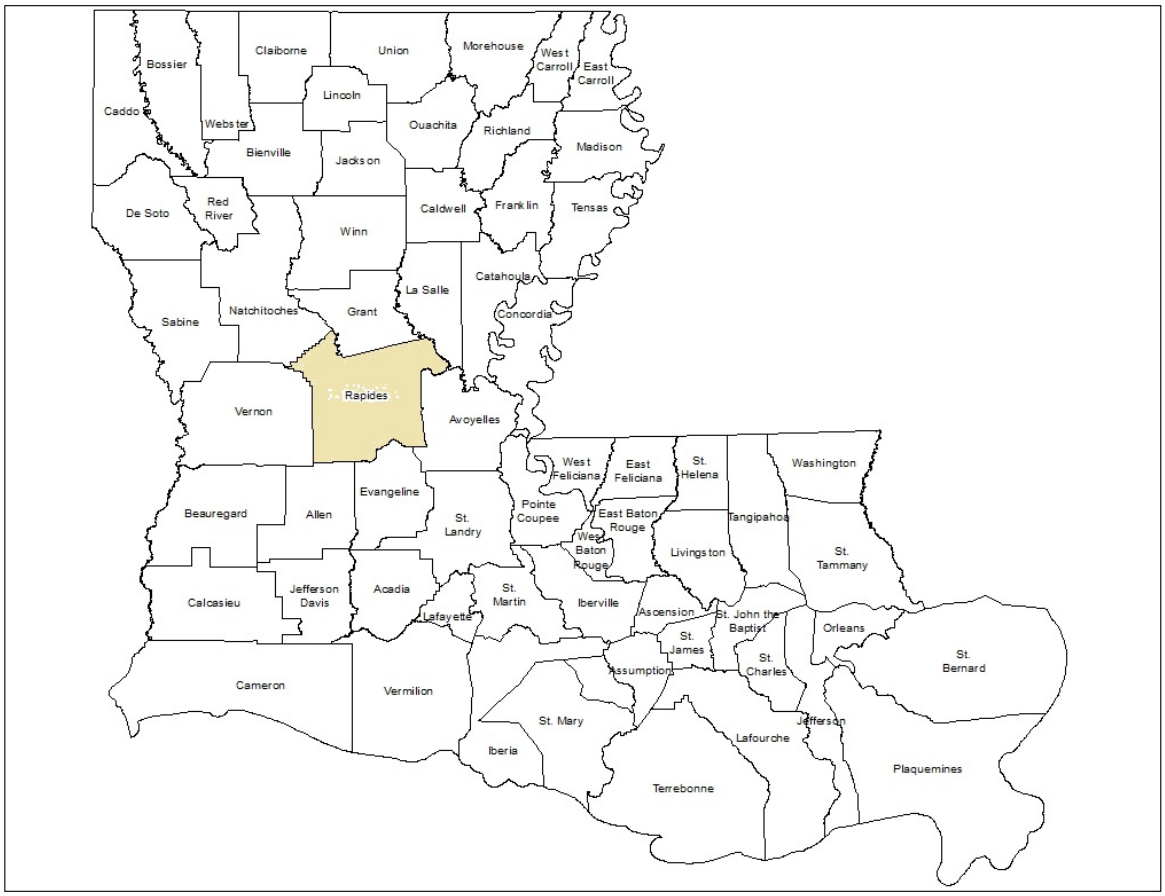

Figure 2: Louisiana parish map showing Rapides Parish shaded.

4 Relationship to Regional Planning

The Alexandria Regional ITS Architecture is an integral part of planning for the operations and maintenance strategies that are addressed by the regional transportation planning process. The architecture provides a framework that connects operations and maintenance objectives and strategies with the integrated transportation system improvements that are implemented as a progressive series of ITS projects. The architecture is also used to define the data needs associated with performance monitoring that supports an informed planning process. This chapter identifies the planning objectives, strategies, and associated performance measures from the regional plan. These planning elements are connected with ITS services in the Turbo Architecture database.

Table 1: Relationship to Planning

Number	Type	Name	Description	Source	PM Category	Performance Measure
1	Objective	Increase mobility	Invest in the development of a regional transportation system that serves to increase the mobility and efficiency of the movement of persons and freight in and through the region. This will enhance the following areas: quality of life, economy, and environmental impacts on the region.	Alexandria/Pineville Metropolitan Transportation Plan 2034	Mobility	Vehicle hours traveled (VHT)
						Vehicle miles traveled (VMT)
2	Objective	Enhance Safety	Enhance the safety of the transportation system during both normal travel patterns and emergency evacuations. Enhance the security of the transportation system especially related to emergency evacuation from either natural or man-made disasters.	Alexandria/Pineville Metropolitan Transportation Plan 2034	Crashes	Crashes per year
						Number of Fatalities
3	Objective	Maintain Existing Infrastructure	Support systematic and coordinated maintenance programs, and make available the adequate resources to preserve existing roadways and transit systems as well as future expansions.	Alexandria/Pineville Metropolitan Transportation Plan 2034	Pavement	Pavement Condition Index
					Bridges	Bridge Condition Rating
						Remaining Service Life

5 ITS Stakeholders

Effective ITS architecture development involves the integration of multiple stakeholders and their transportation systems. This section describes the stakeholders who either participated in the creation of the Alexandria Regional ITS Architecture or whom the participating stakeholders felt needed to be included in the architecture. Some stakeholders have been grouped in order to better reflect mutual participation or involvement in transportation services and elements. **Table 2** gives a brief description of each stakeholder identified for the Alexandria regional Architecture. **Section 6** describes the ITS system inventory and the association of these stakeholders with the elements in this inventory.

Table 2: ITS Stakeholders

Stakeholder Name	Stakeholder Description
City of Alexandria	The City of Alexandria is responsible for traffic management, incident management, emergency response and management, and other transportation system management activities within its jurisdiction.
City of Pineville	The City of Pineville is responsible for street maintenance and is impacted by incidents along the Pineville expressway.
England Airpark (international airport)	Alexandria International Airport is a public use airport located approximately four miles west of the central business district of Alexandria, in Rapides Parish, Louisiana, United States. The airport is operated by the England Authority, also known as the England Economic and Industrial Development District, an independent political subdivision of the State of Louisiana. Despite its name, the airport operates neither international flights nor flights to cities near border lines.
LADOTD	Louisiana Department of Transportation and Development (LADOTD) is an arm of the Louisiana government responsible for state-wide transportation. The LADOTD is responsible for statewide transportation system operations. This stakeholder group includes all DOTD units (ITS, Office of Planning Programming, Highway Safety, Weights and Standards, Traffic Services, and Traffic Engineering) involved in transportation planning, operations, and maintenance. Some of the typical responsibilities include incident detection and response, evacuation planning and management, transportation data collection, management, and distribution for the local region as well as for the entire state.
Local Emergency Medical Providers	This includes local hospitals and emergency medical service providers (i.e., ambulance, air vac, etc) that are components of emergency management.
Local/Regional Public Safety Agencies	Responsible for operating local police, fire, and EMS offices and vehicles throughout region. This stakeholder group includes all agencies that are involved in emergency, fire, police, and other public safety/emergency response activities.
Louisiana State Police	Louisiana State Police agency is responsible for operating Louisiana State Police Troops. Includes Computer Aided Dispatch database, which collects incident/emergency detection, dispatch, response, and status information related to the Louisiana State Police officers/equipment and vehicles.
Media	This stakeholder group includes local TV/Radio stations, and print media that are responsible for receiving and distributing transportation information like traffic conditions, incidents and road weather conditions.
Public	Members of the general public own and operate various devices/systems to access ITS information, including PDAs, cell phones, and personal computers.
Rapides Area Planning Commission	The Rapides Area Planning Commission is a regional organization providing land use planning, development, technical assistance, geographical information, and other planning services for member governments. RAPC offers building code enforcement through permits and inspections to all of Central Louisiana. The Planning Commission also houses The Metropolitan Planning Organization which provides transportation planning for the urbanized area of Rapides Parish and Transit Planning for all the Kisatchie-Delta Planning and Development District.
Rapides Parish Police Jury	The Police Jury is the governing authority for Rapides Parish. Rapides Parish is located in central Louisiana and encompasses 1,362 square miles area and has a population of over 131,000.
Tourism and Traveler Information Service Providers	Various tourism agencies, chambers of commerce, hotel associations, motorist services, and Mapquest.

6 ITS System Inventory

An inventory of existing and planned transportation systems is the basis for the Alexandria Regional ITS Architecture. The transportation system inventory was developed based on input from stakeholders throughout the region. The inventory includes a list of ITS elements and the associated stakeholder responsible for system operation.

This section describes every surface transportation inventory element for the region. A transportation element can be a center, a vehicle, a traveler or a piece of field equipment. Each transportation element listed below has one or more stakeholders associated with it from **Section 5**. In order to reduce the complexity of the architecture, some transportation elements with like functionality have been grouped together. Each transportation inventory element is mapped to at least one National ITS Architecture entity.

Table 3: ITS Inventory

Element Name	Element Description	Stakeholder	Element Status
Airport ITS Field Equipment	This element represents the airports ITS field equipment such as CCTV cameras and weather information systems	England Airpark (international airport)	Existing
Airport Landside Operations	This element represents the airports landside operations such as facility, grounds, parking etc for the Alexandria International Airport	England Airpark (international airport)	Existing
Alexandria TMC	This element represents traffic operations center that is responsible for local traffic management activities. The typical activities include traffic monitoring, traffic data collection, operation of ITS elements (CCTV, DMS, etc.), detection and verification of incidents, traffic signal monitoring, and other traffic management related activities. This also includes communicating with other agencies, districts, TMCs, and DOTD departments like maintenance for roadway maintenance activities. The Alexandria TMC is a local TMC as it only provides operations for the Rapides area	LADOTD	Planned
ATRANS Transit Administration	ATRANS provides transit service for the Cities of Alexandria and Pineville Monday through Saturday. The system is operated by the City of Alexandria. Eight routes provide scheduled fixed route service to the service area. Five of the eleven buses providing service are ADA accessible. ATRANS also provides a demand response paratransit service for qualifying persons who are unable to access the fixed route service because of disabilities. This service requires users to fill out an application qualifying them for the service and requires a 24-hour advance notice to schedule service.	City of Alexandria	Existing
ATRANS Transit Fleet	This element represents the fleet of buses and other public transit vehicles use to provide service to the citizens of Alexandria and Pineville.	City of Alexandria	Existing
City of Alexandria Engineering	This element represents traffic operations or traffic engineering within the city that is responsible for traffic management activities within the jurisdiction. The typical activities include traffic monitoring, traffic data collection, traffic signal operations, and other traffic management related activities.	City of Alexandria	Existing
City of Alexandria Police Department	This element represents the City of Alexandria Police dispatch center	City of Alexandria	Existing
City of Alexandria Traffic Signal System	This element represents traffic signals operated and maintained by the City of Alexandria	City of Alexandria	Existing
City of Pineville Police Department	This element represents the City of Pineville Police dispatch center	City of Pineville	Existing

Element Name	Element Description	Stakeholder	Element Status
DOTD District 08 Traffic Operations	This element represents traffic operations or traffic engineering within the district office that is responsible for traffic management activities within the district jurisdiction. The typical activities include traffic monitoring, traffic data collection, traffic signal operations, and other traffic management related activities. This also includes communicating with TMCs and other departments like maintenance for roadway maintenance activities.	LADOTD	Existing
DOTD District 08 Traffic Signal System	This element represents traffic signals operated and maintained by the District	LADOTD	Existing
DOTD ITS Field Equipment	This element includes the equipment distributed on and along the roadway that monitors and controls traffic and monitors and manages the roadway itself. Equipment includes traffic signals, traffic detectors, environmental sensors, highway advisory radios, dynamic message signs, CCTV cameras and video image processing systems, and grade crossing warning systems.	LADOTD	Existing
DOTD ITS Section	This element represents ITS Section (Section 56) under the LADOTD. The ITS section is responsible for statewide operations center located in DOTD headquarters. Also, the ITS section is responsible for management information system for transportation, statewide ITS elements operations, and maintenance. The ITS section is also responsible for maintenance of all ITS equipment in the state.	LADOTD	Existing
DOTD MAP	This element represents the Motorist Assistance Patrol (MAP) vehicles contracted by DOTD's ITS Section, but operated and maintained by the DOTD's District Offices.	LADOTD	Planned
DOTD Social Media	Facebook and Twitter	LADOTD	Existing
DOTD Statewide TMC	This element represents traffic operations center that is responsible for traffic management activities throughout the state. The typical activities include traffic monitoring, traffic data collection, operation of ITS elements (CCTV, DMS, etc.), detection and verification of incidents, traffic signal monitoring, and other traffic management related activities. This also includes communicating with other agencies, districts, TMCs, and DOTD departments like maintenance for roadway maintenance activities.	LADOTD	Existing
Local Emergency Medical	Local hospitals as well as local emergency medical service providers (e.g., emergency rescue, ambulance, etc)	Local Emergency Medical Providers	Existing
Local Emergency Operations Centers	This element represents emergency dispatch centers operated by local agencies including 911, emergency, and fire response dispatch center.	Local/Regional Public Safety Agencies	Existing
Local Print and Broadcast Channels	Local Newspapers as well as radio and television broadcast providing transportation information	Media	Existing
Louisiana 511/Website	This element provides traveler information service provided by the LA DOTD in conjunction with private partner.	LADOTD	Existing
LSP Troop E	This element represents Louisiana State Police department; the Alexandria metropolitan area is covered by Troop E.	Louisiana State Police	Existing
Other Local Public Safety Agencies	These are the local police/sheriff departments and 911 centers for the agencies that do not have a primary role in Traffic incident management and enforcement on major highways in the area	Local/Regional Public Safety Agencies	Existing
RAPC Database	This element represents RAPC data service which directly or indirectly collects and provides transportation system data.	Rapides Area Planning Commission	Planned
Rapides Office of Emergency Preparedness 911 Administration	This element represents the parish emergency response operations including City fire, police, 911, and any other emergency response operators.	Rapides Parish Police Jury	Existing
Rapides Parish Sheriff's Office	This element represents the Rapides Parish Sheriff's Office dispatch center	Local/Regional Public Safety Agencies	Existing

Element Name	Element Description	Stakeholder	Element Status
Tourism and Travel Service Information Sources	Private Tourism and Traveler Information Websites, local hotel associations, visitor centers, etc.	Tourism and Traveler Information Service Providers	Existing
Traveler	Motorist or user of the regional transportation system	Public	Existing

6.1 Existing Regional ITS Systems and Operations

Currently Alexandria does not have a regional architecture but has ITS elements that impact the area. These elements have been compiled in **Table 4**. The existing ITS equipment table serves as examples of low level systems, whereas the ITS Inventory in **Table 3** is a much higher, broader level of planning. The following sections further describe the existing equipment.

Table 4: Inventory of ITS Elements

ITS Equipment	Description	Stakeholder	Element Name
Statewide 511	Construction, major incidents, freeway speed	LADOTD	Louisiana 511/website
State Signal Systems	287 Signals	LADOTD	LADOTD District 08
City of Alexandria Signal system	68 signals including school crossings and caution lights.	City of Alexandria	City of Alexandria Signal system
Portable Changeable Message Signs (PCMS)	4 Portable Message Signs	LADOTD	DOTD ITS Field Equipment

6.1.1 Traveler Information System

The 511 Traveler Information System allows drivers to actively engage in smart travel by choosing less congested routes and avoiding incident areas. 511 can be reached by most cell phones and landlines or accessed on the internet at www.511LA.org. The Information provided for Statewide 511 from Alexandria is limited to construction and lane closures on state routes and bridges. Usually law enforcement provides incident information. All 511 information is provided to TMC via email as public notices.

The 511 lane closure and construction information is communicated from DOTD District 08 to the statewide TMC. Incidents that occur on the state routes are communicated from the State Police and municipal police to the statewide 511 center in Baton Rouge. The speed information for the Alexandria area is extracted from Google speed data.

6.2 Transportation Issues

6.2.1 High Congestion and Incidents

6.2.1.1 Pineville Expressway (US 167)

The Pineville Expressway is a critical corridor because incidents on this expressway create significant congestion on US 167, LA 28E, LA 107, and US 165. Sight distances are inadequate in the vicinity of two overpasses on this expressway and have caused some incidents in the past. Also, the limited available ramp length connecting the Pineville Expressway to LA 107 creates unsafe merging situations. Pineville Police identified this expressway as their number one issue.

6.2.1.2 MacArthur Boulevard

MacArthur Blvd parallels I-49 and has an ADT similar to I-49. This route has a traffic circle at the intersection of LA 165 and Masonic Drive. The main problem on MacAuthur Blvd is congestion due to poor signal coordination. The MacArthur Blvd traffic signal system needs to be centrally controlled from US 165 to LA 71 in order to alleviate congestion. Also the accident rates along this route are high. This route has been identified by the Alexandria Police as their number two issue.

6.2.2 During Coastal Disasters

A key issue identified is that during coastal disasters or emergencies, Alexandria serves as a vital location for the state's disaster mitigation plan. Its centralized location in the state makes it the first major city beyond the potential hurricane impact zone and therefore a major destination for emergency evacuation from the coastal areas.

The following have been identified as very beneficial to the Alexandria area during emergency evacuations:

- Sharing GIS data among the 10 parishes
- information sharing (wireless) among the 10 parishes when incidents are near the parish boarders
- Video Sharing with the Sheriff's office
- Access to traffic timing plans – for planning purposes, alternate routes during evacuation along the major routes e.g. (I-49, US 71, US 165, US 167, LA 1, and LA 171)
- Road status (incident, congestion, bottlenecks, road closures)
- Rapides Parish Emergency Response 911 member at the Alexandria TMC
- Dynamic Message Signs along the evacuation routes entering Alexandria from the south and north.
- A state automated road closure notification system (display or written) to both the media and 911 emergency response
- MAP service during emergencies

6.2.3 Other Issues in the Region

Periodic events (fairs) create congestion along LA 28 W and US 167 as far as the Ester Field Road intersection near Proctor and Gamble manufacturing plant. This area is prone to congestion due to a combination of high volume and limited road capacity.

A new Bridge is being built on US 165 that will increase capacity from 2 to 4 lanes and expected to be completed in 3 years. It is anticipated that even after completion of the bridge congestion and incidents may continue to be issues. Signal preemption for emergency vehicles (fire, EMT, etc) is desirable in this corridor to enhance response time. DMS placed in both directions of I-49 entering the city will be useful in communicating the condition of the roadway to the traveling public. Another area with congestion is LA 107 to Marksville through Avoyelles Parish which has periodic heavy congestion due to casino traffic.

6.2.4 Other Signal Coordination Issues

Improved signal coordination on Jackson Street is required to enhance mobility in the area. Masonic Drive signals at Texas Avenue and Memorial Drive have been turned over to the City of Alexandria and could benefit from signal coordination. The signals along Bolton Avenue also need improved coordination. The signals along LA 28 East and West also need improved signal coordination.

7 ITS Services

ITS services describe what can be done to improve the efficiency, safety, and convenience of the regional transportation system through better information, advanced systems and new technologies. Some services are specific to one primary stakeholder while others require broad stakeholder participation. This section describes the ITS services that meet the transportation needs in the region.

Table 5: ITS Services

Service package	Service package Name	Service package Description	Service package Status	Included Elements
AD1	ITS Data Mart	This service package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.	Planned	Alexandria TMC DOTD Statewide TMC RAPC Database
AD2	ITS Data Warehouse	This service package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this service package in addition to the basic query and reporting user access features offered by the ITS Data Mart.	Planned	Alexandria TMC ATRANS Transit Administration City of Alexandria Engineering DOTD District 08 Traffic Operations DOTD Statewide TMC Local Emergency Operations Centers LSP Troop E RAPC Database Rapides Office of Emergency Preparedness 911 Administration
APTS02	Transit Fixed-Route Operations	This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.	Planned	ATRANS Transit Administration

Service package	Service package Name	Service package Description	Service package Status	Included Elements
APTS06	Transit Fleet Management	This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.	Planned	ATRANS Transit Administration ATRANS Transit Fleet
APTS07	Multi-modal Coordination	This service package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers and Transit Agencies.	Planned	Airport Landside Operations ATRANS Transit Regional TMC
APTS08	Transit Traveler Information	This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.	Planned	ATRANS Transit Administration ATRANS Transit Fleet Louisiana 511/Website Traveler
APTS09	Transit Signal Priority	This service package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.	Planned	ATRANS Transit Administration ATRANS Transit Fleet DOTD District 08 Traffic Operations Regional TMC
ATIS01	Broadcast Traveler Information	This service package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the service package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this service package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.	Planned	DOTD Social Media Local Print and Broadcast Channels Louisiana 511/Website LSP Troop E Tourism and Travel Service Information Sources Traveler

Service package	Service package Name	Service package Description	Service package Status	Included Elements
ATIS02	Interactive Traveler Information	This service package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices.	Planned	Traveler
ATIS06	Transportation Operations Data Sharing	This service package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.	Planned	Alexandria TMC City of Alexandria Engineering DOTD District 08 Traffic Operations DOTD ITS Section DOTD Statewide TMC
ATMS01	Network Surveillance	This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this service package enables traffic managers to	Existing	Alexandria TMC City of Alexandria Engineering DOTD District 08 Traffic Operations DOTD ITS Field Equipment DOTD Statewide TMC

Service package	Service package Name	Service package Description	Service package Status	Included Elements
		monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.		Louisiana 511/Website
ATMS02	Traffic Probe Surveillance	This service package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this service package: 1) wide-area wireless communications between the vehicle and center is used to communicate vehicle operational information and status directly to the center, and 2) dedicated short range communications between passing vehicles and the roadside is used to provide equivalent information to the center. The first approach leverages wide area communications equipment that may already be in the vehicle to support personal safety and advanced traveler information services. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short range communications applications identified within the architecture.	Planned	Alexandria TMC DOTD Statewide TMC
ATMS03	Surface Street Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This service package is consistent with typical urban traffic signal control systems.	Existing	Alexandria TMC City of Alexandria Engineering City of Alexandria Traffic Signal System DOTD District 08 Traffic Operations DOTD District 08 Traffic Signal System
ATMS04	Freeway Control	This service package provides central monitoring and control, communications, and field equipment that support freeway management. It supports a range of freeway management control	Planned	Alexandria TMC DOTD ITS Field Equipment

Service package	Service package Name	Service package Description	Service package Status	Included Elements
		strategies including ramp metering, interchange metering, mainline lane controls, mainline metering, and other strategies including variable speed controls. This package incorporates the instrumentation included in the Network Surveillance Service package to support freeway monitoring and adaptive strategies as an option. This service package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this service package allows general advisory and traffic control information to be provided to the driver while en route.		DOTD Statewide TMC
ATMS06	Traffic Information Dissemination	This service package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information.	Planned	Alexandria TMC DOTD ITS Field Equipment DOTD Statewide TMC
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include coordinated signal control in a metropolitan area and coordination between freeway operations and arterial signal control within a corridor. This service package advances the Surface Street Control and Freeway Control Service packages by adding the communications links and integrated control strategies that enable integrated interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	Alexandria TMC City of Alexandria Engineering DOTD District 08 Traffic Operations DOTD ITS Field Equipment DOTD Statewide TMC
ATMS08	Traffic Incident Management System	This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and	Planned	Alexandria TMC City of Alexandria Police Department DOTD District 08 Traffic Operations DOTD ITS Field Equipment

Service package	Service package Name	Service package Description	Service package Status	Included Elements
		event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination service package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.		DOTD ITS Section DOTD Statewide TMC LSP Troop E Other Local Public Safety Agencies Rapides Office of Emergency Preparedness 911 Administration Rapides Parish Sheriff's Office
ATMS09	Traffic Decision Support and Demand Management	This service package recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. Recommendations may include predefined incident response plans and regional surface street and freeway control strategies that correct network imbalances. Where applicable, this service package also recommends transit, parking, and toll strategies to influence traveler route and mode choices to support travel demand management (TDM) programs and policies managing both traffic and the environment. TDM recommendations are coordinated with transit, parking, and toll administration centers to support regional implementation of TDM strategies. Incident response and congestion management recommendations are implemented by the local traffic management center and coordinated with other regional centers by other service packages (see ATMS07-Regional Traffic Management and ATMS08-Traffic Incident Management).	Planned	Alexandria TMC DOTD Statewide TMC

Service package	Service package Name	Service package Description	Service package Status	Included Elements
ATMS10	Electronic Toll Collection	This service package provides toll operators with the ability to collect tolls electronically and detect and process violations. The fees that are collected may be adjusted to implement demand management strategies. Field-Vehicle Communication between the roadway equipment and the vehicle is required as well as Fixed Point-Fixed Point interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Toll violations are identified and electronically posted to vehicle owners. Standards, inter-agency coordination, and financial clearinghouse capabilities enable regional, and ultimately national interoperability for these services. Two other service packages, APTS04: Transit Fare Collection Management and ATMS16: Parking Facility Management also provide electronic payment services. These three service packages in combination provide an integrated electronic payment system for transportation services. The vehicle equipment and roadside readers that these systems utilize can also be used to collect road use statistics for highway authorities. This data can be collected as a natural by-product of the toll collection process or collected by separate readers that are dedicated to probe data collection.	Planned	Airport Landside Operations
ATMS16	Parking Facility Management	This service package provides enhanced monitoring and management of parking facilities. It assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. This service package collects current parking status, shares this data with Information Service Providers and Traffic Management, and collects parking fees using the same in-vehicle equipment utilized for electronic toll collection or contact or proximity traveler cards used for electronic payment. Two other service packages, APTS04: Transit Fare Collection Management and ATMS10: Electronic Toll Collection also provide electronic payment services. These three service packages in combination provide an integrated electronic payment system for transportation services.	Planned	Airport Landside Operations
ATMS17	Regional Parking Management	This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.	Planned	Airport Landside Operations
ATMS19	Speed Monitoring	This service package monitors the speeds of vehicles traveling through a roadway system. If the speed is determine to be excessive, roadside equipment can suggest a safe driving speed. Environmental conditions may be monitored and factored into the safe speed advisories that are provided to the motorist. This service can also support notifications to an enforcement agency to enforce the speed limit on a roadway system.	Planned	Alexandria TMC DOTD ITS Field Equipment DOTD Statewide TMC
EM01	Emergency Call-Taking and Dispatch	This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment	Planned	DOTD MAP DOTD Statewide TMC Local Emergency Medical

Service package	Service package Name	Service package Description	Service package Status	Included Elements
		of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Subsystem and an Emergency Vehicle supports dispatch and provision of information to responding personnel.		Other Local Public Safety Agencies Rapides Office of Emergency Preparedness 911 Administration
EM04	Roadway Service Patrols	This service package supports roadway service patrol vehicles that monitor roads that aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The service package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.	Existing	Alexandria TMC City of Alexandria Police Department DOTD ITS Section DOTD MAP DOTD Statewide TMC Rapides Office of Emergency Preparedness 911 Administration
EM05	Transportation Infrastructure Protection	This service package includes the monitoring of transportation infrastructure (e.g., bridges, tunnels and management centers) for potential threats using sensors and surveillance equipment and barrier and safeguard systems to control access, preclude an incident, and mitigate the impact of an incident if it occurs. Threats can result from acts of nature (e.g., hurricanes, earthquakes), terrorist attacks or other incidents causing damage to the infrastructure (e.g., stray barge hitting a bridge support). Infrastructure may be monitored with acoustic, environmental threat (such as nuclear, biological, chemical, and explosives), infrastructure condition and integrity, motion and object sensors and video and audio surveillance equipment. Data from such sensors and surveillance equipment may be processed in the field or sent to a center for processing.	Planned	Airport ITS Field Equipment DOTD ITS Field Equipment
EM06	Wide-Area Alert	This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites.	Planned	Alexandria TMC DOTD Statewide TMC Rapides Office of Emergency Preparedness 911 Administration
EM08	Disaster Response and Recovery	This service package enhances the ability of the surface transportation system to respond to and recover from disasters. It	Planned	DOTD Statewide TMC

Service package	Service package Name	Service package Description	Service package Status	Included Elements
		addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks). The service package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The service package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this service package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response.		Local Emergency Medical LSP Troop E
EM09	Evacuation and Reentry Management	This service package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The service package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning. This service package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity.	Planned	Alexandria TMC DOTD District 08 Traffic Operations DOTD Statewide TMC Local Emergency Medical Local Emergency Operations Centers LSP Troop E
EM10	Disaster Traveler Information	This service package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This	Planned	Local Emergency Operations Centers Local Print and Broadcast Channels

Service package	Service package Name	Service package Description	Service package Status	Included Elements
		service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems. A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public.		Tourism and Travel Service Information Sources
MC04	Weather Information Processing and Distribution	This service package processes and distributes the environmental information collected from the Road Weather Data Collection service package. This service package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination service package, and aid operators in scheduling work activity.	Planned	Alexandria TMC DOTD ITS Section DOTD Statewide TMC Local Emergency Operations Centers
MC07	Roadway Maintenance and Construction	This service package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.	Existing	Alexandria TMC DOTD District 08 Traffic Operations DOTD ITS Section DOTD Statewide TMC
MC08	Work Zone Management	This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., ISP, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.	Existing	Alexandria TMC DOTD District 08 Traffic Operations DOTD ITS Field Equipment DOTD ITS Section DOTD Statewide TMC

Service package	Service package Name	Service package Description	Service package Status	Included Elements
MC12	Infrastructure Monitoring	This service package monitors the condition of pavement, bridges, tunnels, associated hardware, and other transportation-related infrastructure (e.g., culverts) using both fixed and vehicle-based infrastructure monitoring sensors. Fixed sensors monitor vibration, stress, temperature, continuity, and other parameters and mobile sensors and data logging devices collect information on current infrastructure condition. This service package also monitors vehicle probes for vertical acceleration data and other probe data that may be used to determine current pavement condition.	Planned	DOTD ITS Field Equipment
				DOTD ITS Section

8 Interface between Systems

The interfaces of the transportation systems in this architecture are based on the National ITS Architecture and tailored to reflect the plan for this region. Architecture diagrams display the transportation systems in the Alexandria Regional ITS Architecture and, more importantly, how these systems are and will be connected with one another so that information can be exchanged and transportation services can be coordinated. Stakeholders may use these diagrams to identify integration opportunities. Each system in the region can be represented with two types of diagrams: an overall interconnect diagram and element specific architecture flow context diagram. These diagrams are described below.

The interconnect context diagram shows the connections between systems (i.e., Elements). Interconnects are represented as single lines and indicate information sharing without specifying the type of information being shared or the direction of the information movement, shown as planned or existing. An architecture flow context diagram shows a particular system and all other systems with which it is interconnected, the information being shared (i.e. architecture flows), and the direction of the flow. Descriptions of the architecture flow definitions are included in **Appendix A**. The architecture context flow and interconnect context diagrams are also presented in **Appendix B** to better illustrate the interconnections and information flow between the interfaces of the systems in the region. In order to ease reading these figures, some flow diagrams have been substituted with the corresponding interconnect context diagram. Detailed flow diagrams for each element are contained in the Turbo Architecture™ database. Turbo Architecture™ can be used to create tailored interconnect and architecture flow diagrams for any system in the database.

9 Operational Concept

The Operational Concept lists the roles and responsibilities (RR) that each participating agency must take on to provide the ITS services included in the ITS Architecture. Changing needs may arise that will require an agreement to be formed between all affected parties that defines new or additional roles. Defining the roles and responsibilities of the participating stakeholders in the region and the willingness of agencies to accept their roles and responsibilities is an important step in realizing the common goal of an interoperable ITS system throughout the region.

Table 6: Operational Concept

RR Area Name	Stakeholder	RR Description	RR Status
Archived Data Systems for Alexandria Regional ITS Architecture	LADOTD	Traffic data collection	Planned
	Local Emergency Medical Providers	Medical response	Existing
	Louisiana State Police	Incident response	
		Speed enforcement	
		Emergency response	
	Rapides Area Planning Commission	Transportation planning	
		Archive data management	Planned
Emergency Management for Alexandria Regional ITS Architecture	City of Alexandria	Emergency response	Existing
	City of Pineville	Emergency response	
	England Airpark (international airport)	resource provider	
	LADOTD	Traffic signal system maintenance and construction	
		Infrastructure monitoring	Planned
		ITS Software and hardware maintenance	
		ITS Field Equipment maintenance and construction	
	Local Emergency Medical Providers	Medical response	Existing
	Louisiana State Police	Emergency response	
		Traffic control	Planned
	Media	Motorist information	Existing
	Public	End user of traveler information	
	Tourism and Traveler Information Service Providers	Motorist information	
Freeway Management for Alexandria Regional ITS Architecture	City of Alexandria	Incident response	Existing
		Emergency response	
		Incident management	
	City of Pineville	Incident response	Existing
		Incident management	
		Emergency response	
	LADOTD	Traffic operations	Existing
		Event monitoring	
		Traffic data collection	Planned
		Infrastructure monitoring	
		Motorist information systems	
		Traffic Control	
		ITS Field Equipment maintenance and construction	
	Louisiana State Police	Incident response	Existing
		Speed enforcement	
		Emergency response	
	Media	Motorist information	Existing

RR Area Name	Stakeholder	RR Description	RR Status
	Rapides Area Planning Commission	Transportation planning	
		Archive data management	Planned
	Tourism and Traveler Information Service Providers	Motorist information	Existing
Incident Management for Alexandria Regional ITS Architecture	City of Alexandria	Incident response	Existing
		Incident management	
	City of Pineville	Incident response	
		Incident management	
	LADOTD	Traffic operations	
		Event monitoring	
		Motorist information systems	
		Traffic data collection	Planned
		Infrastructure monitoring	
		Traffic Control	
	Local Emergency Medical Providers	Medical response	Existing
	Local/Regional Public Safety Agencies	Incident response	
	Local/Regional Public Safety Agencies	Traffic control	Planned
	Louisiana State Police	Incident response	Existing
		Speed enforcement	
		Emergency response	
		Traffic control	Planned
	Media	Motorist information	Existing
	Rapides Area Planning Commission	Transportation planning	
		Crash data collection	Planned
		Crash data	
		Traffic data collection	
	Tourism and Traveler Information Service Providers	Motorist information	Existing
Maintenance and Construction for Alexandria Regional ITS Architecture	City of Alexandria	Traffic signal system maintenance and construction	Existing
		Surface street maintenance and construction	
	City of Pineville	Traffic signal system maintenance and construction	Existing
		Surface street maintenance and construction	
	LADOTD	Traffic signal system maintenance and construction	Existing
		Roadway maintenance and construction	
		Infrastructure monitoring	Planned
		ITS Software and hardware maintenance	
		ITS Field Equipment maintenance and construction	
	Media	Motorist information	Existing
	Rapides Area Planning Commission	Transportation planning	
		Archive data management	Planned
	Tourism and Traveler Information Service Providers	motorist information	Existing
Surface Street Management for Alexandria Regional ITS Architecture	City of Alexandria	Traffic signal system maintenance and construction	Existing

RR Area Name	Stakeholder	RR Description	RR Status
		Surface street maintenance and construction	
		Traffic operations	
	City of Pineville	Surface street maintenance and construction	
		Traffic operations	
		Traffic signal system maintenance and construction	Planned
	LADOTD	Traffic operations	Existing
		Traffic signal system maintenance and construction	
		Roadway maintenance and construction	
		Infrastructure monitoring	Planned
		Traffic Control	
		ITS Software and hardware maintenance	
		ITS Field Equipment maintenance and construction	
	Media	Motorist information	Existing
	Rapides Area Planning Commission	Transportation planning	
		Traffic data collection	Planned
	Tourism and Traveler Information Service Providers	Motorist information	Existing
Transit Services for Alexandria Regional ITS Architecture	City of Alexandria	Transit Provider	Existing
	LADOTD	Transit information systems	Planned
	Media	Transit information	Existing
	Public	End user of traveler information	
	Tourism and Traveler Information Service Providers	Motorist information	

9.1 ITS Deployment Plan-Sequence of Planned Projects

The Alexandria Regional ITS Architecture is implemented one ITS project at a time. This section lists the projects that have been identified as part of the regional ITS architecture. Additional details for each of these ITS projects are included in the Turbo Architecture database.

Table 7: Project Sequence

Name	Description	Service Scope	Geographic Scope	Timeframe	Market Packages	Design Cost			Capital Cost			O&M			Total Cost		
Alexandria Traffic Signal Upgrades	Upgrade existing traffic signal corridors	Where needed, upgrade includes support poles, cabinets, controllers, detection, wiring, indications, signage, pedestrian access ramps, push buttons, communications, central system software, and integration. Operations of signal systems are based on owner agencies and agreements established.	State and Local Routes including the following: -LA 71 MacArthur -LA 28 East -LA 28 West -LA 1208 Jackson St. Extension -LA 1 Bolton Ave	1 year	ATMS03	$ 150,000.00	-	$ 264,000.00	$ 3,000,000.00	-	$ 3,300,000.00	$ 450,000.00	-	$ 825,000.00	$ 3,600,000.00	-	$ 4,389,000.00
Alexandria ITS Deployment Phase 1	Deployment of ITS field equipment and integration with Advanced Traffic Management Systems (ATMS)	Deploy ITS field equipment including but not limited to DMS, CCTV Cameras and vehicle detection for travel times. Operations of equipment envisioned to be provided by the Statewide TMC. Maintenance to be provided by DOTD ITS Section 56	I-49 corridor	1 year	AD1 AD2 APTS08 ATMS01 ATMS02 ATMS03 ATMS04 ATMS06 ATMS07 ATMS08 ATMS19 ATMS20 EM01 EM04 EM06 EM08 EM09 EM10	$ 62,000.00	-	$ 108,000.00	$ 1,240,000.00	-	$ 1,350,000.00	$ 186,000.00	-	$ 337,500.00	$ 1,488,000.00	-	$ 1,795,500.00
Motorist Assistance Patrol Deployment	Project to deploy Motorist Assistance Patrol vehicles and services	- Motorist Services (e.g., chilled water, change tires, fuel, first aid, etc) - Tow service on bridge (if deemed critical) - Emergency vehicle fleet - Traffic Incident Management services - TMC Support - General contract management	LA 71 (MacArthur Drive) and Pineville Expressway	1 Year	EM04 MC12	$ 5,000.00	-	$ 16,000.00	$ 100,000.00	-	$ 200,000.00	$ 15,000.00	-	$ 50,000.00	$ 120,000.00	-	$ 266,000.00

Name	Description	Service Scope	Geographic Scope	Timeframe	Market Packages	Design Cost		Capital Cost		O&M		Total Cost	
Alexandria TMC	Establish a local Transportation Management Center (TMC)	TMC Operations to include: -Active monitoring of traffic conditions on state and federal routes -Disseminating information for emergencies, incidents and amber alerts -Coordination for Traffic Incident Management -Agency outreach -Dispatching MAP	Alexandria MPO area - Coverage to include state and federal routes. TMC proposed to be located at the Old Louisiana State Police Troop E site in the southeast quadrant of the LA 1/US 71 interchange.	2-4 years	AD1 AD2 APTS08 ATMS01 ATMS02 ATMS03 ATMS04 ATMS06 ATMS07 ATMS19 ATMS20 EM01 EM04 EM06 EM08 EM09 EM10 MCO7 MC08	$ 5,000.00	- $ 16,000.00	$ 100,000.00	- $ 200,000.00	$ 15,000.00	- $ 50,000.00	$ 120,000.00	- $ 266,000.00
Alexandria ITS Deployment Phase 2	Deployment of ITS field equipment along major arterial routes and integration ATMS	Deploy ITS field equipment including but not limited to DMS, CCTV Cameras, automated prepare to stop signs for bridge crossing railroads, and vehicle detection. Operations of equipment envisioned to be provided by the Alexandria TMC and the Statewide TMC. Maintenance is to be provided by DOTD ITS Section 56.	US 167 (Alexandria Pineville Expressway) and feeder route LA 28 East	3-5 years	AD1 AD2 APTS08 ATMS01 ATMS03 ATMSO4 ATMS06 ATMS07 ATMS08 ATMS20 EM01 EM04 EM06 EM08 EM09 EM10	$ 87,500.00	- $ 149,600.00	$ 1,750,000.00	- $ 1,870,000.00	$ 262,500.00	- $ 467,500.00	$ 2,100,000.00	- $ 2,487,100.00
Alexandria ITS Deployment Phase 3	Deployment of ITS field equipment along major arterial routes and integration with ATMS	Deploy ITS field equipment including but not limited to CCTV cameras, Destination Dynamic Message Signs, and Vehicle Detection for travel times Operations of equipment envisioned to be provided by the Alexandria TMC and the Statewide TMC. Maintenance is to be provided by DOTD ITS Section 56.	US 71 (MacArthur Drive), US 71/US 165, and US 167 (Alexandria Pineville Expressway)	4-5 years	AD1 AD2 APTS08 ATMS01 ATMS03 ATMS04 ATMS06 ATMS07 ATMS08 ATMS20 EM01 EM04 EM06 EM08 EM09 EM10	$ 76,500.00	- $ 132,000.00	$ 1,530,000.00	- $ 1,650,000.00	$ 229,500.00	- $ 412,500.00	$ 1,836,000.00	- $ 2,194,500.00
Alexandria ITS Deployment Phase 4	Deployment of ITS field equipment along major arterial routes and integration with ATMS	Deploy ITS field equipment including but not limited to arterial DMS, CCTV Cameras, Vehicle Detection for travel times.	I-49	5+ years	AD1 AD2 APTS08 ATMS01 ATMS03 ATMS04	$ 61,000.00	- $ 108,000.00	$ 1,220,000.00	- $ 1,350,000.00	$ 183,000.00	- $ 337,500.00	$ 1,464,000.00	- $ 1,795,500.00

Name	Description	Service Scope	Geographic Scope	Timeframe	Market Packages	Design Cost		Capital Cost			O&M		Total Cost		
		Operations of equipment envisioned to be provided by the Alexandria TMC and the Statewide TMC. Maintenance is to be provided by DOTD ITS Section 56			ATMS06 ATMS07 ATMS08 ATMS20 EM01 EM04 EM06 EM08 EM09 EM10										

9.2 Operations and Maintenance of Regional ITS

Currently, LADOTD ITS Section (Section 56) is responsible for providing statewide ITS equipment O&M support for equipment on state and federal routes. DOTD Traffic Signals are maintained by the district office or by a municipality through an agreement. On other routes, the agency responsible for the ITS is the facility owner. Typically, ITS maintenance activities are performed on an as-needed basis with the exception of routine/preventive maintenance. Every regional ITS does not have dedicated funding source/structure for periodic maintenance of the system. As the transportation funding resources struggle to keep up with the demand, it is critical to understand the capital cost versus O&M cost balance over the life-cycle of any ITS. As the Alexandria region prepares to expand and enhance existing ITS, it is critical to identify which agency will be responsible for a proposed ITS and how many resources will be required for O&M of the system. The more ITS deployment there is in the region, the less money will there be available for new ITS deployment in successive time periods.

In this document, subject O&M resource/responsibilities have been covered under two different sections: one defining agency O&M responsibilities and the other specifying O&M funding requirements. In **Table 5**, maintenance responsibilities have been identified/assigned to a particular agency for each applicable service package. Although, such O&M arrangements may differ at a project level based on specific agencies involved, the operations and maintenance requirements section under each service package provides guidelines on which agency should assume the maintenance responsibilities for each ITS component.

As far as the long term funding is considered, there is currently no dedicated long term maintenance funding for any ITS in the region. LADOTD currently has a statewide maintenance budget of $2 million, which serves for both routine and emergency maintenance. **Table 7** above not only identifies capital cost requirements for ITS but also provides O&M funding requirements for all of the planned ITS. For most systems, an estimated dollar figure is provided as the O&M cost; in the case where a dollar value is not provided, 10% of capital cost shall be assumed as the O&M cost per year.

9.3 ITS Funding

As mentioned earlier, currently there is no dedicated funding source for ITS deployments in the Alexandria region. LADOTD ITS Section has a capital budget of $10 million each year as part of the highway funding program, which is allocated statewide on a prioritized basis depending on immediate need. Although a part of this money is typically allocated to each region, there is currently no dedicated funding source for ITS in the Alexandria Regional Transportation Improvement Program (TIP) to cover all the identified projects. As part of the follow-up to this architecture effort, it is recommended that Rapides Area Planning Commission (RAPC), being the regional planning entity, work together with LADOTD and the other Alexandria stakeholders and pursue funding sources for the ITS deployment within the region.

10 Architecture Maintenance Plan

This section discusses the proposed Maintenance Plan for the regional ITS Architecture. FHWA's Final Rule on ITS Architecture and Standards (23 CFR Part 940) requires development of an architecture maintenance plan. Paragraph 940.9 (f) states that:

> "The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining it, as needs evolve within the region."

In January 2004, FHWA issued guidance for developing and maintaining regional ITS infrastructure (http://ops.fhwa.dot.gov/its_arch_imp/guidance.htm). The Maintenance Plan for the Alexandria Regional ITS Architecture is based on the guidelines provided by FHWA's White Paper 1 on what should be contained in an architecture maintenance plan in order to be compliant with FHWA requirements. The White Paper on this subject is available at http://ops.fhwa.dot.gov/its_arch_imp/policy_1.htm. This section provides some background on the need for architecture maintenance and addresses key issues under the following headings:

- Why Maintain a Regional ITS Architecture?
- Who Will Maintain the Architecture?
- When will the Architecture be updated?
- What will be maintained?
- How will the Architecture be maintained?

10.1 Why Maintain a Regional ITS Architecture

As ITS projects are implemented, the regional ITS architecture will need to be updated to reflect new ITS priorities and strategies that emerge through the transportation planning process. It will also need to be updated to account for expansion in ITS scope and to allow for the evolution and incorporation of new ideas. The goal of the maintenance plan is to guide controlled updates to the regional ITS architecture baseline so that it continues to accurately reflect the region's existing ITS capabilities and future plans.

10.2 Who Will Maintain the Architecture?

To maintain a consensus regional ITS architecture, ideally all stakeholders should participate in the process. In practice, typically, one or two agencies take the lead responsibility to maintain the regional ITS architecture. The primary requirements of the regional architecture maintainer are the mission/authority to perform such functions and the necessary skills to perform the same. The mission of the ITS architecture maintainer most closely resembles a regional planning body that, consistent with its mission, has the authority to initiate, update, and document changes in regional planning documents. For the Alexandria Regional ITS Architecture, the LADOTD will assume the role of the ITS Architecture keeper and maintainer as indicated in **Section 3.4**.

Like the regional transportation plans, architecture maintenance is recurring, and is a necessary long-term effort. To be effective in ITS architecture maintenance, LADOTD will need to have staff that:

- Is knowledgeable of the existing regional ITS architecture. This implies a detailed technical understanding of the various parts of the architecture and how changes would affect each part.
- Has an understanding of transportation systems in the region. This understanding can reside jointly in the group of agencies/ stakeholders who participate in the maintenance process.

- Has an understanding of the tools used to create (and to update) the architecture. This might include, for example, knowledge of the Turbo Architecture™ tool, if that is used to hold some of the architecture information.

As the agency responsible for maintaining the architecture, the LADOTD needs to have the skills within its own organization and/or use a qualified consultant. In either case, the agency needs the necessary funding to support the maintenance effort. The following are the recommended minimum resources for ITS architecture maintenance management:

- One individual to be the ITS architecture manager
- Two individuals trained in Turbo Architecture™ and ITS Planning (Considering this is a new functional/skill area, the training will need to be comprehensive and will require resources: three work days for Turbo™ training and four weeks to study regional and national architecture documents)
- Approximately sixteen man-hours per month for ITS architecture maintenance activities. This may be performed by the manager or designee.
- Manage the update of the Regional ITS Architecture Turbo Architecture™ source file with project level ITS architectures
- Facilitate ITS Steering Committee meetings annually. The ITS Steering Committee is made up of representative from each stakeholder in the region.
- A qualified consultant to assist with the ITS architecture maintenance activities. (LADOTD has on a retainer contract a professional engineering consulting firm to provide ITS, TIM Program, TMC Operations Staffing and Systems Engineering Support)

Although LADOTD will lead the architecture maintenance activities, like all other regional planning activities, ITS architecture maintenance will take close coordination between several agencies. LADOTD will need to coordinate with other major stakeholders* in the region, including:

- Louisiana Department of Transportation and Development (LADOTD) District 08
- LADOTD ITS Section
- Louisiana State Police (Troop E)
- Rapides Area Planning Commission (RAPC)

*Note – Other stakeholders may be included as necessary based on ITS development and deployment activities.

As LADOTD takes responsibility for architecture maintenance, they will use agreements to create a management/oversight function (e.g. a “Regional ITS Architecture Maintenance Committee”) to oversee regional ITS architecture maintenance work, which would have representation from the key stakeholders to the agreement as listed above. At minimum, such a committee will include two LADOTD representatives, one RAPC representative, and one FHWA representative.

It is proposed that such a Regional ITS Architecture Maintenance Committee will be responsible for recommending/presenting the proposed changes to the MPO Technical Advisory Committee (Same committee that approves regional planning documents). The Regional ITS Architecture Maintenance Committee will meet annually to report/discuss any changes to ITS in the region. All the regional stakeholders will be responsible for informing/updating the regional maintenance committee about new ITS deployments in their region. The architecture maintenance committee will also be responsible for following up with all of the regional stakeholders to ensure that any and all ITS deployments are reported and documented in the regional plan.

Following this architecture adoption by the MPO, it is recommended that the Regional ITS Architecture Maintenance Committee meet at least once per year to:

- Review progress in ITS implementation projects
- Verify that the regional ITS architecture Turbo Architecture™ source file is kept up to date with the region's ITS projects
- Update plans for future deployments by each regional stakeholder
- Review changes in State and National ITS Architectures, regulations, and requirements, if any
- Determine any needs for an update to the Alexandria Regional ITS Architecture

10.3 When will the Architecture be Updated?

The regional ITS architecture is not static. It must change as plans change, as ITS projects are implemented, and as the ITS needs and services evolve in the region.

At a minimum, the regional ITS architecture will be reviewed annually by the Regional ITS Architecture Maintenance Committee. The Regional ITS Architecture Maintenance Committee may meet and perform architecture updates more frequently to keep with the pace of the region's ITS implementation. Annual or more frequent updates will include integrating completed projects into the regional ITS architecture Turbo Architecture™ source file. A one page summary of the change will be added as an appendix to the regional ITS architecture document.

Regardless of the frequency selected for periodic updates, it is recommended that the Committee recognize the potential need for "Exception Maintenance" to occur in the event of major project implementations, major revisions to the National ITS Architecture, or to meet the requirements of future regulations.

It is recommended that the regional ITS architecture is fully updated every five years, prior to the periodic updating of the Regional Transportation Improvement Program, which occurs once a year.

Upon recommendation of the Regional Architecture Maintenance Committee, the MPO Technical Advisory Committee will make a resolution to accept any revisions/changes/updates to the ITS architecture.

The following list includes many of the events that may cause change to a regional ITS architecture:

10.3.1 Changes in Regional Needs

Regional ITS architectures are created to support transportation planning in addressing regional needs. Over time these needs can change and the corresponding aspects of the regional ITS architecture that addresses these needs may need to be updated. These changes in needs should be expressed in updates to planning documents such as the Regional Transportation Plan.

10.3.2 New Stakeholders

Regional ITS architectures are created to support transportation planning in addressing regional needs. Over time these needs can change and new stakeholders will be introduced. The corresponding aspects of the regional ITS architecture that addresses these needs may need to be updated. These changes in needs should be expressed in updates to planning documents such as the Regional Transportation Plan.

10.3.3 Changes in Scope of Service Considered

The range of services considered by the regional ITS architecture expands. This might happen because the National ITS Architecture has been expanded and updated to include new user services or to better define how existing elements satisfy the user services. The National ITS Architecture may have expanded to include a user service that has been discussed in a region, but not in the regional ITS architecture, or was included in only a very cursory manner. Changes

in the National ITS Architecture are not of themselves a reason to update a regional ITS architecture, but a region may want to consider any new services in the context of their regional needs.

10.3.4 Changes in Stakeholder of Element Names

An agency's name or the name used to describe their element(s) undergoes change. Transportation agencies occasionally merge, split, or are just renamed. In addition, element names may evolve as projects are defined. The regional ITS architecture should be updated to use the current, correct names for both stakeholders and elements.

10.3.5 Changes in Other Architectures

A regional ITS architecture covers not only elements and interfaces within a region, but also interfaces to elements in adjoining regions. Changes in the regional ITS architecture in one region may necessitate changes in the architecture in an adjoining region to maintain consistency between the two. Architectures may also overlap (e.g. a statewide ITS architecture and a regional ITS architecture for a region within the state) and a change in one might necessitate a change in the other.

10.3.6 Changes due to Project Definitions or Implementation

There are several changes relating to project definition that will cause the need for updates to the regional ITS architecture. When actually defined or implemented, a project may add, subtract or modify elements, interfaces, or information flows from the regional ITS architecture. Because the regional ITS architecture is meant to describe the current, as well as future, regional implementation of ITS, it must be updated to correctly reflect how the developed projects integrate into the region.

10.3.7 Changes due to Project Addition/Deletion

Occasionally a project will be added or deleted through the planning process, or through project delivery, and some aspects of the regional ITS architecture that are associated with the project may be expanded, changed, or removed.

10.3.8 Changes in Project Priority

Due to funding constraints, or other considerations, the planned project sequencing may change. Delaying a project may have a ripple effect on other projects that depend on it. Raising the priority for a project's implementation may impact other projects that are related to it.

10.4 What Will be Maintained?

Those constituent parts of a regional ITS architecture that will be maintained is referred to as the "baseline." This section considers the different "parts" of the regional ITS architecture and whether they should be a part of the baseline. Baseline parts are annually updated within the regional ITS architecture Turbo file and every five years within the document. The parts discussed are:

- Description of Region
- List of Stakeholders
- Operational Concepts
- List of ITS Elements
- List of Agreements
- Interfaces between Elements
- System Functional Requirements
- Applicable ITS Standards
- Project Sequencing

One of the benefits of a regional ITS architecture is to enable the efficient exchange of information between ITS elements in a region and with elements outside the region. Efficiency refers to the economical deployment of ITS elements and their interfaces. The result of these ITS deployments should be contributions to the safe and efficient operation of the surface transportation network. Each of the components in the regional ITS architecture below have a role in this economy and an appropriate effort should be levied to maintain them.

10.4.1 Description of Region

This description includes the geographic scope, functional scope, and architecture timeframe, and helps frame each of the following parts of a regional ITS architecture. Geographic scope defines the ITS elements that are "in" the region, although additional ITS elements outside the region may be need to be described if they communicate ITS information to elements inside the region. Functional scope defines which services are included in a regional ITS architecture. Architecture timeframe is the distance (in years) into the future that the regional ITS architecture will consider. The description of the region is usually contained in an architecture document, but may reside in a database containing aspects of the regional ITS architecture, and should certainly be a part of the baseline.

10.4.2 List of Stakeholders

Stakeholders are of great importance to the definition of the architecture. Within a region, they may consolidate or separate and such changes should be reflected in the architecture. Furthermore, stakeholders that have not been engaged in the past may be approached through outreach to be sure that the regional ITS architecture represents their ITS requirements as well. The stakeholders should be described in architecture documentation (and may also reside in a database representing aspects of the regional ITS architecture). Their listing and description should be part of the baseline.

10.4.3 Operational Concepts

It is crucial that the operational concepts represented as roles and responsibilities or as customized service packages in a regional ITS architecture accurately represent the consensus vision of how the stakeholders want their ITS to operate for the benefit of surface transportation users. These should be reviewed and, if necessary, changed to represent both what has been deployed (which may have been shown as "planned" in the earlier version of the regional ITS architecture) and the current consensus view of the stakeholders. Many of the remaining maintenance efforts will depend on the outcome of the changes made here. The operational concept will reside in the architecture documentation and possibly in a diagramming tool if a customized service package approach is used, and should be part of the baseline.

10.4.4 List of ITS Elements

The inventory of ITS elements is a key aspect of the regional ITS architecture. Changes in stakeholders as well as operational concepts may impact the inventory of ITS elements. Furthermore, recent implementation of ITS elements may change their individual status (e.g. from planned to existing). The list of elements is often contained in architecture documentation and is key information in any architecture database. It is a key aspect of the baseline.

10.4.5 List of Agreements

One of the greatest values of a regional ITS architecture is to identify where information will cross an agency boundary, which may indicate a need for an agency agreement. An update to the list of agreements can follow the update to the Operational Concept and/or interfaces between elements. The list of agreements will usually be found in the architecture documentation. This listing should be a part of the baseline.

10.4.6 Interfaces between Elements

Interfaces between elements define the "details" of the architecture. They are the detailed description of how the various ITSs are or will be integrated throughout the timeframe of the architecture. These details are usually held in an architecture database. They are a key aspect of the architecture baseline and one that will likely see the greatest amount of change during the maintenance process.

10.4.7 System Functional Requirements

High-level functions are allocated to ITS elements as part of the regional ITS architecture. These can serve as a starting point for the functional definition of projects that map to portions of the regional ITS architecture. Usually this information is held in spreadsheets or databases, but may be included in the architecture document. They are a part of the baseline.

10.4.8 Applicable ITS Standards

The selection of standards depends on the information exchange requirements. But in addition, the maintenance process should consider how ITS standards may have evolved and matured since the last update and consider how any change in the "standards environment" may impact previous regional standards choices (especially where competing standards exist). For example, if Extensive Markup Language (XML) based Center-To-Center standards reach a high level of maturity, reliability, and cost-effectiveness, then a regional standards technology decision may be made to transition from investments in other standards technologies (e.g. Common Object Request Broker Architecture (CORBA) to XML). The description of the standards environment for the region, as well as the details of which standards apply to the architecture, should be part of the baseline.

10.4.9 Project Sequencing

While project sequencing is partly determined by functional dependencies (e.g. "surveillance" must be a precursor to "traffic management"), the reality is that most project sequences are local policy decisions. Project sequences should be reviewed to make sure that they are in line with current policy decisions. Furthermore, policy makers should be informed of the sequences and their input should be sought to make the project sequences coincide with their expectations. This is crucial to eliminate the possibility of the regional ITS architecture becoming irrelevant. The project sequencing should be included in the architecture documentation and may also be held in a spreadsheet or database. These should be part of the architecture baseline.

10.5 How Will the Architecture be Maintained?

LADOTD ITS Section (Section 56) will oversee and ensure that the regional architecture is maintained. LADOTD will utilize its contracted consulting services contract for ITS Traffic Incident Management (TIM) Program, TMC Operations Staffing and Systems Engineering Support for this effort. The guidelines contained within FHWA's Regional ITS Architecture Maintenance White Paper will be helpful in guiding the maintenance effort. In addition to detailing the recommended maintenance process, the White Paper also contains examples of Maintenance Plans developed by a range of agencies and regions throughout the country.

11 Functional Requirements

Each ITS system operated by the stakeholders must perform certain functions to effectively deliver the ITS services desired by the region. The primary functions that each system needs to perform are broadly defined in the Alexandria Regional ITS Architecture. The high-level requirements are grouped into functional areas that identify requirements associated with each selected ITS service.

Due to the detail of the functional requirements in **Table 8**, they have not been fully included within the written Regional ITS Architecture. However, the functional requirements are available by running a report from the Regional ITS Architecture Turbo Architecture source file which can be made available upon request to the LADOTD ITS Section. **Table 8** below shows a sample of the report output information that can be obtained from Turbo

Table 8: Functional Requirements (Sample)

Element Name	Entity Name	Functional Area	Functional Area Description	Requirement ID	Requirement	Status
Alexandria TMC	Archived Data Management Subsystem	Government Reporting Systems Support	Selects and formats data residing in an ITS archive to facilitate local, state, and federal government data reporting requirements.	1	The center shall provide data from an ITS archive to federal, state, or local government reporting systems.	Planned
				2	The center shall provide the capability to select data from an ITS archive for use in government reports.	Planned
				3	The center shall provide the capability to format data from an ITS archive suitable for input into government reports.	Planned
				4	The center shall support requests for ITS archived data from Government Reporting Systems.	Planned
				5	The center shall provide the applicable meta-data for any ITS archived data to satisfy government reporting system requests. Meta-data may include attributes that describe the source and quality of the data and the conditions surrounding the collection of the data.	Planned
		ITS Data Repository	Collect and maintain data and data catalogs from one or more data sources. May include quality checks, error notification, and archive coordination.	1	The center shall collect data to be archived from one or more data sources.	Planned
For the entire table of functional requirements, see the regional ITS architecture Turbo Architecture source file						

12 Standards

Standardizing the flow of information between the systems is essential to cost-effectively integrating ITS throughout the region. ITS standards are fundamental to the establishment of an open ITS environment that achieves the goal of interoperability for ITS. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve.

Establishing standards for exchanging information among ITS systems is important not only from an interoperability point of view; it also provides interchangeability and expandability thereby reducing risk and cost. Since an agency using standardized interfaces can select among multiple vendors for products and applications, competition is maintained and prices are lower in the long term.

Standards Development Organizations (SDO) are developing ITS standards that support interoperability and interchangeability. Several of the communication standards overlap in applicability. This provides flexibility in the design of ITS systems allowing agencies to choose the most applicable standard for their needs. Before systems are designed, all stakeholders involved in the applicable ITS service(s) should decide upon the standards and their specifics that will be used. Once a decision is made, all future systems should use the agreed upon standards.

Table 9: ITS Standards

Group	SDO	Document ID	Standard Title
No	AASHTO/ITE	ITE TMDD	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)
No	AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions
No	AASHTO/ITE/NEMA	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller (ASC) Units
No	AASHTO/ITE/NEMA	NTCIP 1203	Object Definitions for Dynamic Message Signs (DMS)
No	AASHTO/ITE/NEMA	NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control
No	AASHTO/ITE/NEMA	NTCIP 1206	Object Definitions for Data Collection and Monitoring (DCM) Devices
No	AASHTO/ITE/NEMA	NTCIP 1207	Object Definitions for Ramp Meter Control (RMC) Units
No	AASHTO/ITE/NEMA	NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching
No	AASHTO/ITE/NEMA	NTCIP 1209	Data Element Definitions for Transportation Sensor Systems (TSS)
No	AASHTO/ITE/NEMA	NTCIP 1210	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters
No	AASHTO/ITE/NEMA	NTCIP 1211	Object Definitions for Signal Control and Prioritization (SCP)
No	AASHTO/ITE/NEMA	NTCIP 1214	Object Definitions for Conflict Monitor Units (CMU)
No	APTA	APTA TCIP-S-001 3.0.3	Standard for Transit Communications Interface Profiles
No	ASTM	ASTM E2468-05	Standard Practice for Metadata to Support Archived Data Management Systems
No	ASTM	ASTM E2665-08	Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data
Yes	AASHTO/ITE/NEMA	NTCIP C2C	NTCIP Center-to-Center Standards Group
Yes	AASHTO/ITE/NEMA	NTCIP C2F	NTCIP Center-to-Field Standards Group
Yes	ASTM/IEEE/SAE	DSRC 5GHz	Dedicated Short Range Communication at 5.9 GHz Standards Group
Yes	IEEE	IEEE IM	Incident Management Standards Group
Yes	SAE	ATIS General Use	Advanced Traveler Information Systems (ATIS) General Use Standards Group

13 Agreements

This section identifies the list of existing and future agreements between each of the stakeholder organizations whose ITS systems were or will be exchanging information generated prior to implementing relevant projects. This list identifies the agreements that should be established but does not define the agreements themselves.

Table 10: Agreements

Agreement Title	Agreement Type	Agreement Status	Description	Lead Stakeholder	Associated Stakeholders
Alexandria Regional Motorist Assistance Patrol	Combo1	Planned	Cooperative endeavor Agreement between DOTD and the Rapides Region for providing motorist assistance patrol.	LADOTD	Local Public Safety Agencies
Traffic Signal Maintenance Agreement - LADOTD/Alexandria	Combo1	Existing	Agreement between LADOTD and City of Alexandria for providing maintenance and operations of traffic signals at state intersections within the city limits. Maintenance and operations include payment for electricity, inspection, replacement of inoperative light bulbs and fuses, and straightening of signal heads and signs.	LADOTD	City of Alexandria

APPENDIX - A. Architecture Flow Definitions

Table 11: Architecture Flow Definitions

Flow Name	Flow Description
alert notification	Notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public. The flow identifies the alert originator, the nature of the emergency, the geographic area affected by the emergency, the effective time period, and information and instructions necessary for the public to respond to the alert. This flow may also identify specific information that should not be released to the public.
alert notification coordination	Coordination of emergency alerts to be distributed to the public. This includes notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public and status of the public notification.
alert status	Information indicating the current status of the emergency alert including identification of the traveler and driver information systems that are being used to provide the alert.
archive requests	A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.
archive status	Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.
archived data product requests	A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archived data products	Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.
barrier system control	Information used to configure and control barrier systems that are represented by gates, barriers and other automated or remotely controlled systems used to manage entry to roadways.
barrier system status	Current operating status of barrier systems. Barrier systems represent gates, barriers and other automated or remotely controlled systems used to manage entry to roadways. Status of the systems includes operating condition and current operational state.
current asset restrictions	Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.
data collection and monitoring control	Information used to configure and control data collection and monitoring systems.
emergency archive data	Logged emergency information including information that characterizes identified incidents (routine highway incidents through disasters), corresponding incident response information, evacuation information, surveillance data, threat data, and resource information. Content may include a catalog of available information, the actual information to be archived and associated meta data that describes the archived information.
emergency operations inputs	Emergency operator inputs supporting call taking, dispatch, emergency operations, security monitoring, and other operations and communications center operator functions.
emergency plan coordination	Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.
emergency traffic control information	Status of a special traffic control strategy or system activation implemented in response to an emergency traffic control request, a request for emergency access routes, a request for evacuation, a request to activate closure systems, a request to employ driver information systems to support public safety objectives, or other special requests. Identifies the selected traffic control strategy and system control status.
emergency traffic control request	Special request to preempt the current traffic control strategy in effect at one or more signalized intersections or highway segments, activate traffic control and closure systems such as gates and barriers, activate safeguard systems, or use driver information systems. For example, this flow can request all signals to red-flash, request a progression of traffic control preemptions along an emergency vehicle route, request a specific evacuation traffic control plan, request activation of a road closure barrier system, or place a public safety or emergency-related message on a dynamic message sign.
equipment maintenance status	Current status of field equipment maintenance actions.
evacuation coordination	Coordination of information regarding a pending or in-process evacuation. Includes evacuation zones, evacuation times, evacuation routes, forecast network conditions, and reentry times.
evacuation information	Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.

Flow Name	Flow Description
event information	Special event information for travelers. This would include a broader array of information than the similar "event plans" that conveys only information necessary to support traffic management for the event.
event information request	Request for special event information.
external reports	Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).
fare and price information	Current transit, parking, and toll fee schedule information.
field device status	Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.
field equipment status	Identification of field equipment requiring repair and known information about the associated faults.
freeway control data	Control commands and operating parameters for ramp meters, mainline metering/lane controls and other systems associated with freeway operations.
incident command information coordination	Information that supports local management of an incident. It includes resource deployment status, hazardous material information, traffic, road, and weather conditions, evacuation advice, and other information that enables emergency or maintenance personnel in the field to implement an effective, safe incident response.
incident information	Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.
incident report	Report of an identified incident including incident location, type, severity and other information necessary to initiate an appropriate incident response.
incident response coordination	Incident response procedures and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow provides current situation information, including a summary of incident status and its impact on the transportation system and other infrastructure, and current and planned response activities. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.
incident response status	Status of the current incident response including a summary of incident status and its impact on the transportation system, traffic management strategies implemented at the site (e.g., closures, diversions, traffic signal control overrides), and current and planned response activities.
interactive traveler information	Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.
ISP coordination	Coordination and exchange of transportation information between centers. This flow allows a broad range of transportation information collected by one ISP to be redistributed to many other ISPs and their clients.
logged vehicle routes	Anticipated route information for guided vehicles, special vehicles (e.g., oversize vehicles) or groups of vehicles (e.g., governor's motorcade) that may require changes in traffic control strategy.
maintenance and construction archive data	Information describing road construction and maintenance activities identifying the type of activity, the work performed, and work zone information including work zone configuration and safety (e.g., a record of intrusions and vehicle speeds) information. For construction activities, this information also includes a description of the completed infrastructure, including as-built plans as applicable. Content may include a catalog of available information, the actual information to be archived and associated meta data that describes the archived information.
maintenance and construction resource coordination	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.
maintenance and construction resource request	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.
maintenance and construction resource response	Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.
maintenance and construction work plans	Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.
map update request	Request for a map update which could include a new underlying map or map layer updates.
map updates	Map update which could include a new underlying static or real-time map or map layer(s) update.
probe archive data	Probe data that allows calculation of travel times, volumes, and other measures that support transportation planning. Optionally, this flow also includes origin and destination information for vehicles that opt to provide this information.

Flow Name	Flow Description
remote surveillance control	The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.
resource coordination	Coordination of resource inventory information, specific resource status information, resource prioritization and reallocation between jurisdictions, and specific requests for resources and responses that service those requests.
resource deployment status	Status of resource deployment identifying the resources (vehicles, equipment, materials, and personnel) available and their current status. General resource inventory information and specific status of deployed resources may be included.
resource request	A request for resources to implement special traffic control measures, assist in clean up, verify an incident, etc. The request may poll for resource availability or request pre-staging, staging, or immediate deployment of resources. Resources may be explicitly requested or a service may be requested and the specific resource deployment may be determined by the responding agency.
road network conditions	Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.
road network status assessment	Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.
road network traffic probe data	Aggregated route usage, travel times, and other aggregated data collected from probe vehicles that can be used to estimate current traffic conditions.
roadside archive data	A broad set of data derived from roadside sensors that include current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.
roadway equipment coordination	The direct flow of information between field equipment. This includes transfer of information between sensors and driver information systems (e.g., DMS, HAR) or control devices (e.g., traffic signals, ramp meters), direct coordination between adjacent control devices, interfaces between detection and warning or alarm systems, and any other direct communications between field equipment. This includes information exchanged between a Signal System Master (SSM) and the Signal System Local (SSL) equipment.
roadway information system data	Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, and beacon systems). This flow can provide message content and delivery attributes local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.
roadway information system status	Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.
roadway maintenance status	Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).
security equipment maintenance status	Current status of security surveillance and sensor field equipment maintenance actions.
security field equipment status	Identification of security sensors and surveillance equipment requiring repair and known information about the associated faults.
signal control data	Information used to configure and control traffic signal systems.
signal control status	Status of surface street signal controls including operating condition and current operational state.
speed monitoring control	Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.
speed monitoring information	System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.
traffic archive data	Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived and associated meta data that describes the archived information.
traffic control coordination	Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region.
traffic flow	Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.
traffic images	High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications. This flow includes the images and the operational status of the surveillance system.
traffic information coordination	Traffic information exchanged between TMC's. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information.

Flow Name	Flow Description
traffic probe data	Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.
traffic sensor control	Information used to configure and control traffic sensor systems.
transit archive data	Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived and associated meta data that describes the archived information.
transportation information for operations	Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.
transportation system status	Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.
traveler alerts	Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.
traveler archive data	Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived and associated meta data that describes the archived information.
traveler information for media	General traveler information regarding incidents, unusual traffic conditions, transit issues, or other advisory information that has been desensitized and provided to the media.
traveler profile	Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.
traveler request	A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.
video surveillance control	Information used to configure and control video surveillance systems.
work zone information	Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.

APPENDIX - B. Alexandria Regional ITS Architecture Flow and Context Diagrams

(Where a detailed flow context diagram is too complex to show in this report, the corresponding interconnect context diagram is used. All diagrams can be obtained from the Turbo file)

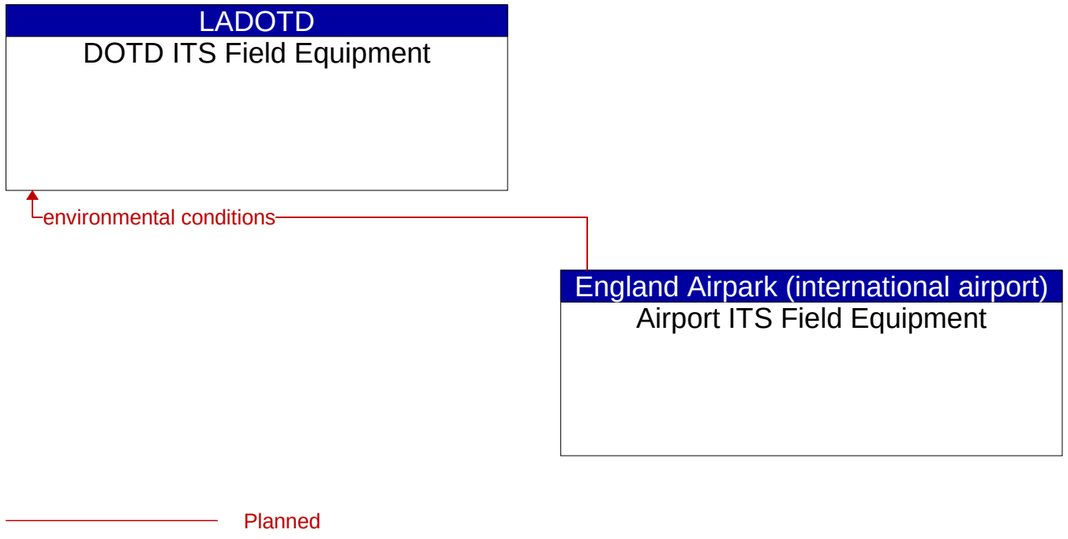

Figure 3: Airport ITS Field Equipment Flow Context Diagram

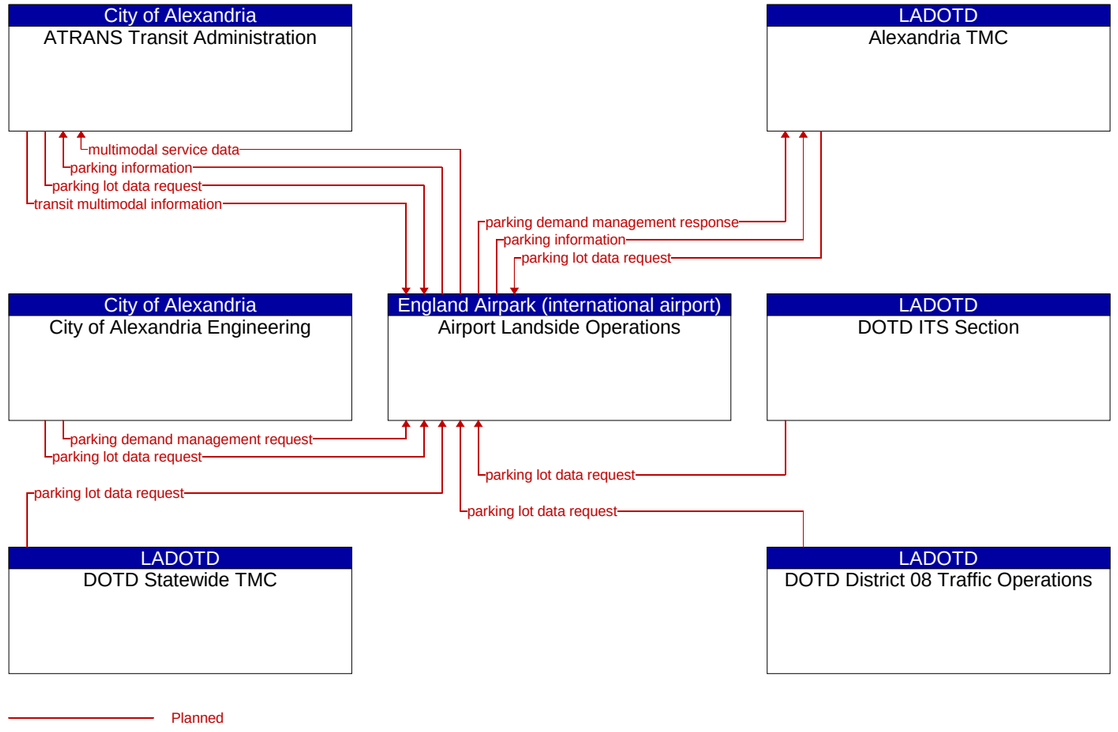

Figure 4: Airport Landside Operations Flow Context Diagram

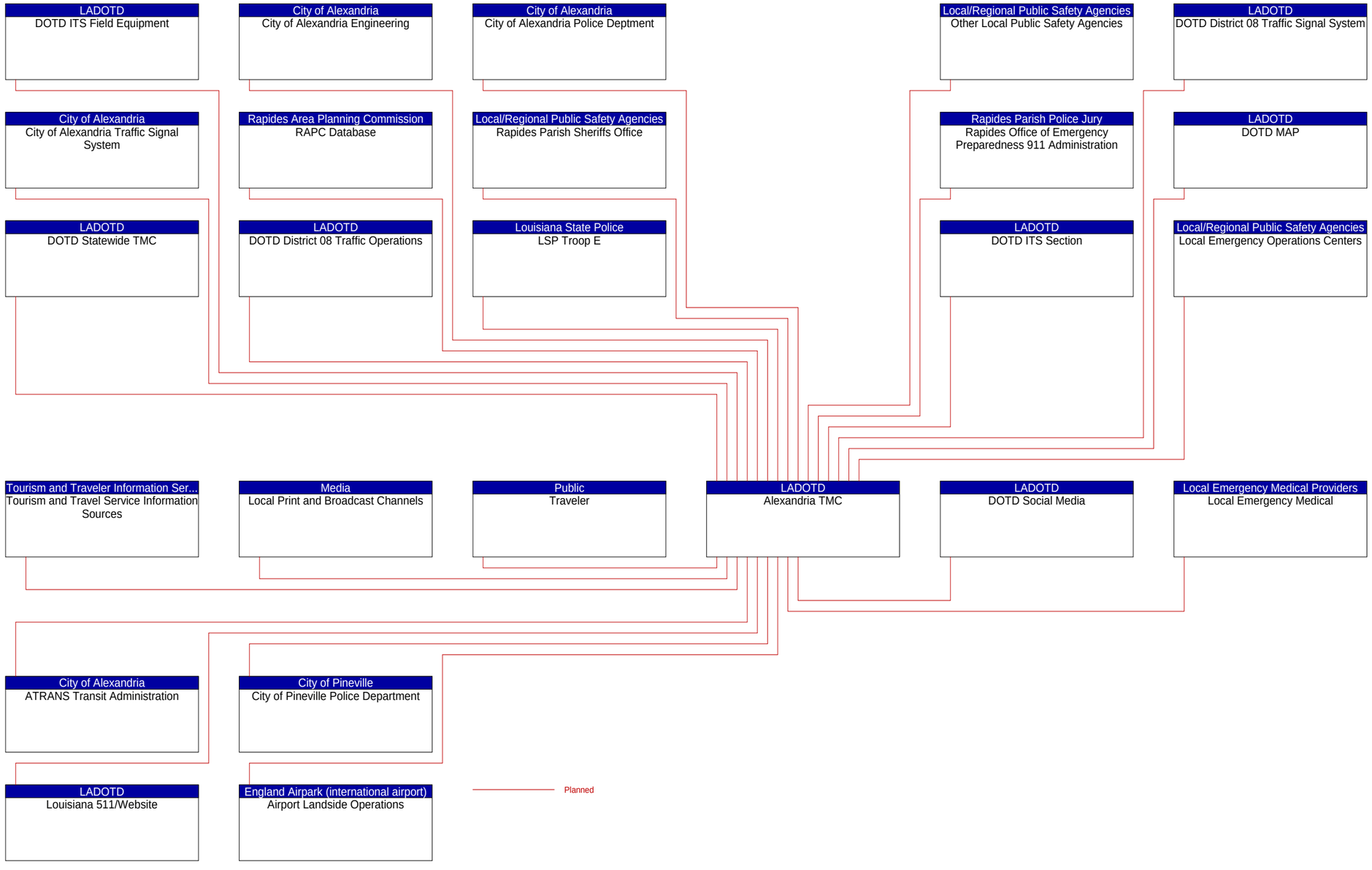

Figure 5: Alexandria TMC Interconnect Context Diagram
(The context diagram is shown here for simplicity. The more detailed flow diagram can be obtained from Turbo)

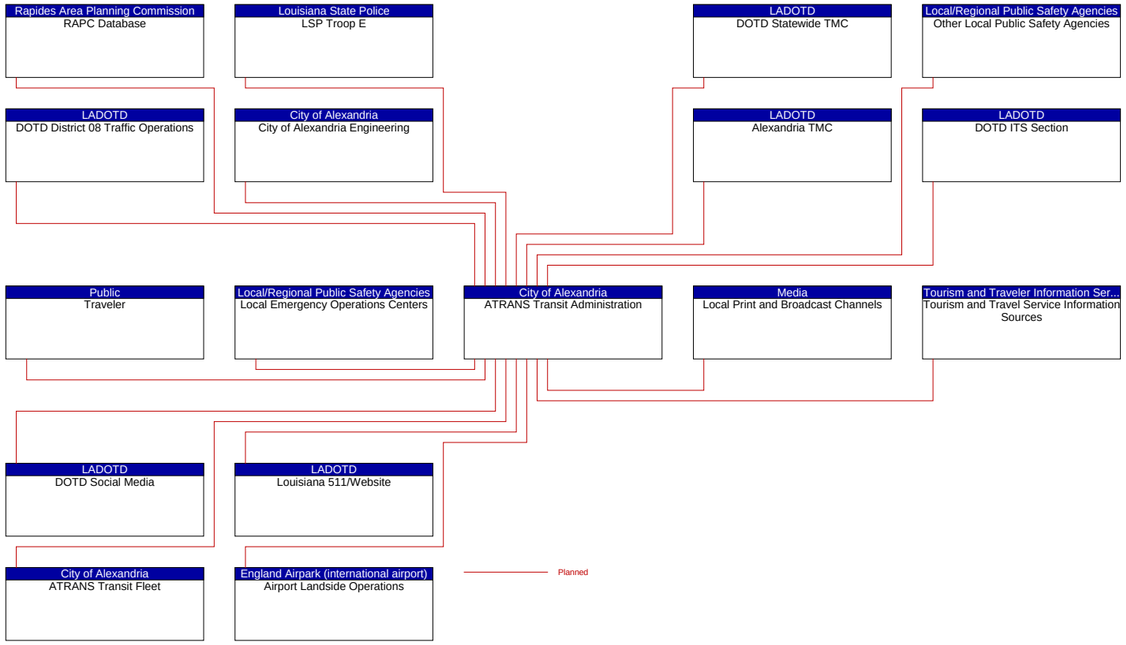

Figure 6: ATRANS Transit Administration Interconnect Context Diagram

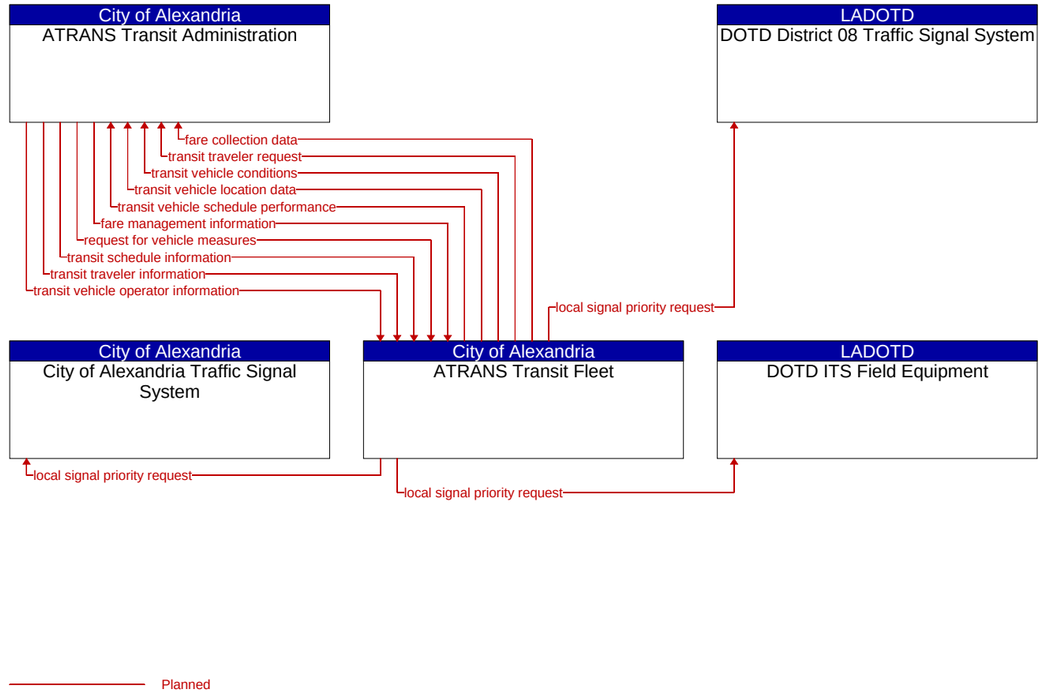

Figure 7: ATRANS Transit Fleet Flow Context Diagram

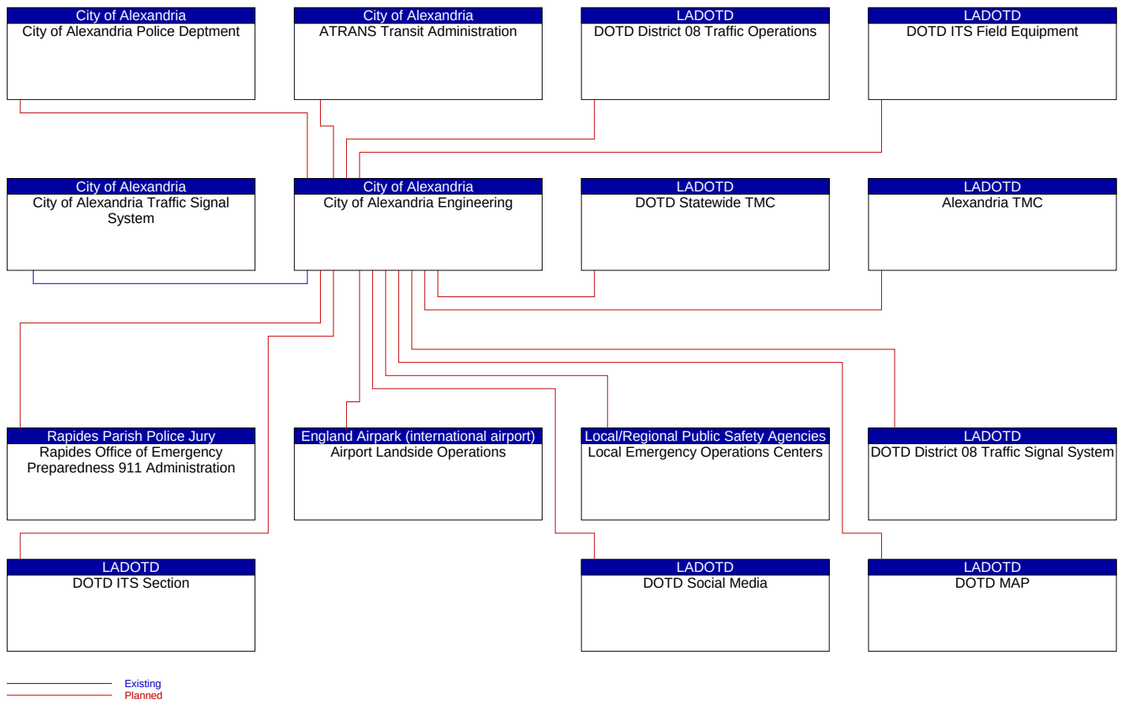

Figure 8: City of Alexandria Engineering Interconnect Context Diagram

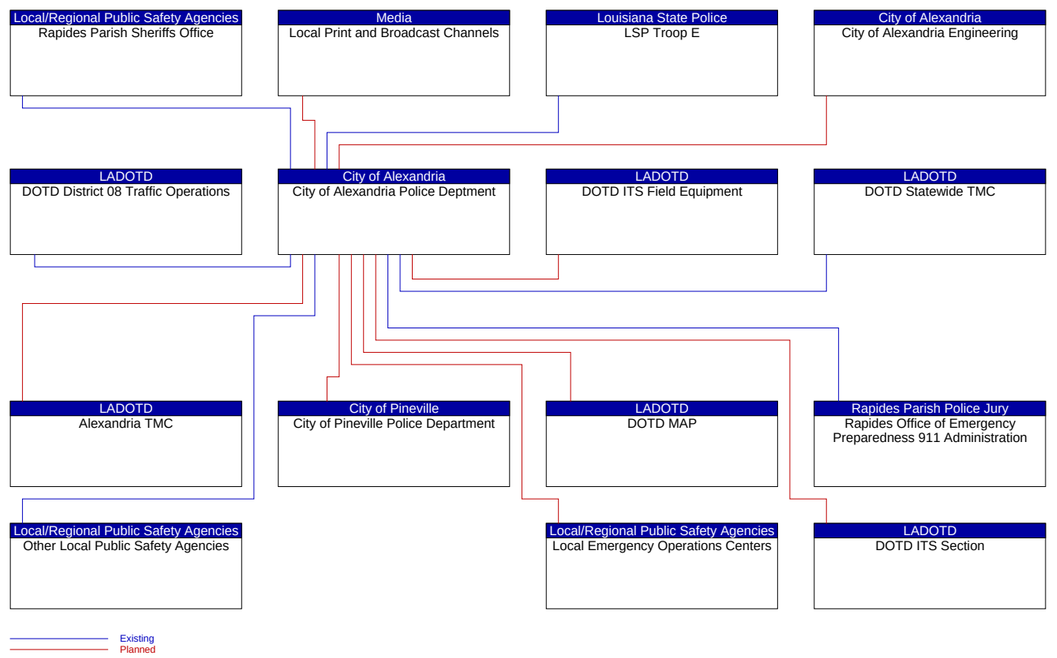

Figure 9: City of Alexandria Police Department Interconnect Context Diagram

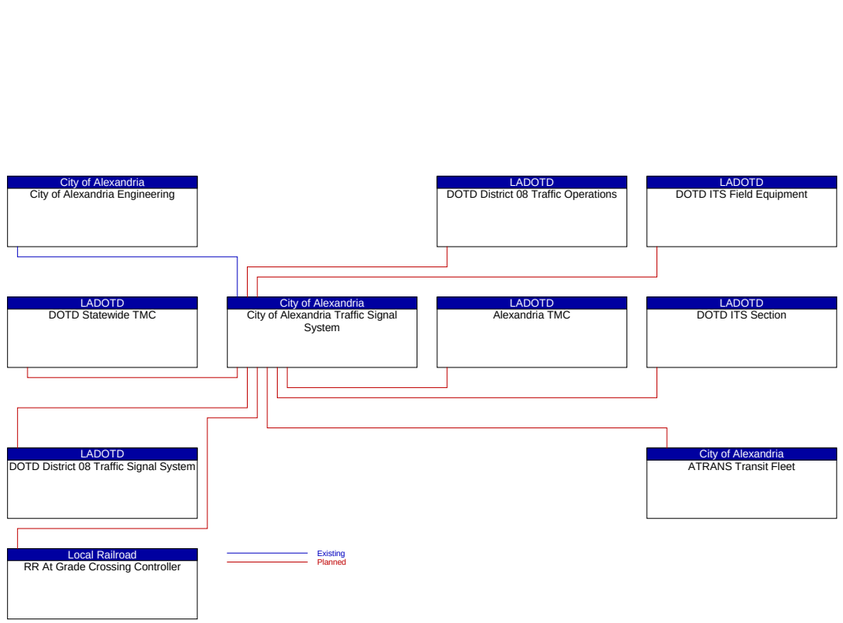

Figure 10: City of Alexandria Traffic Signal System Interconnect Context Diagram

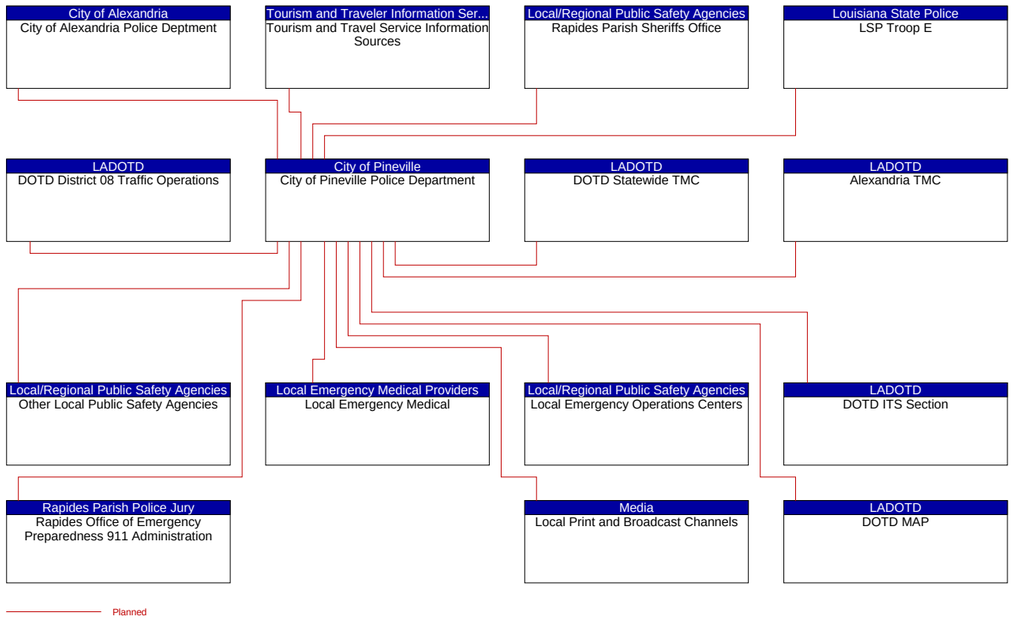

Figure 11: City of Pineville Police Department Interconnect Context Diagram

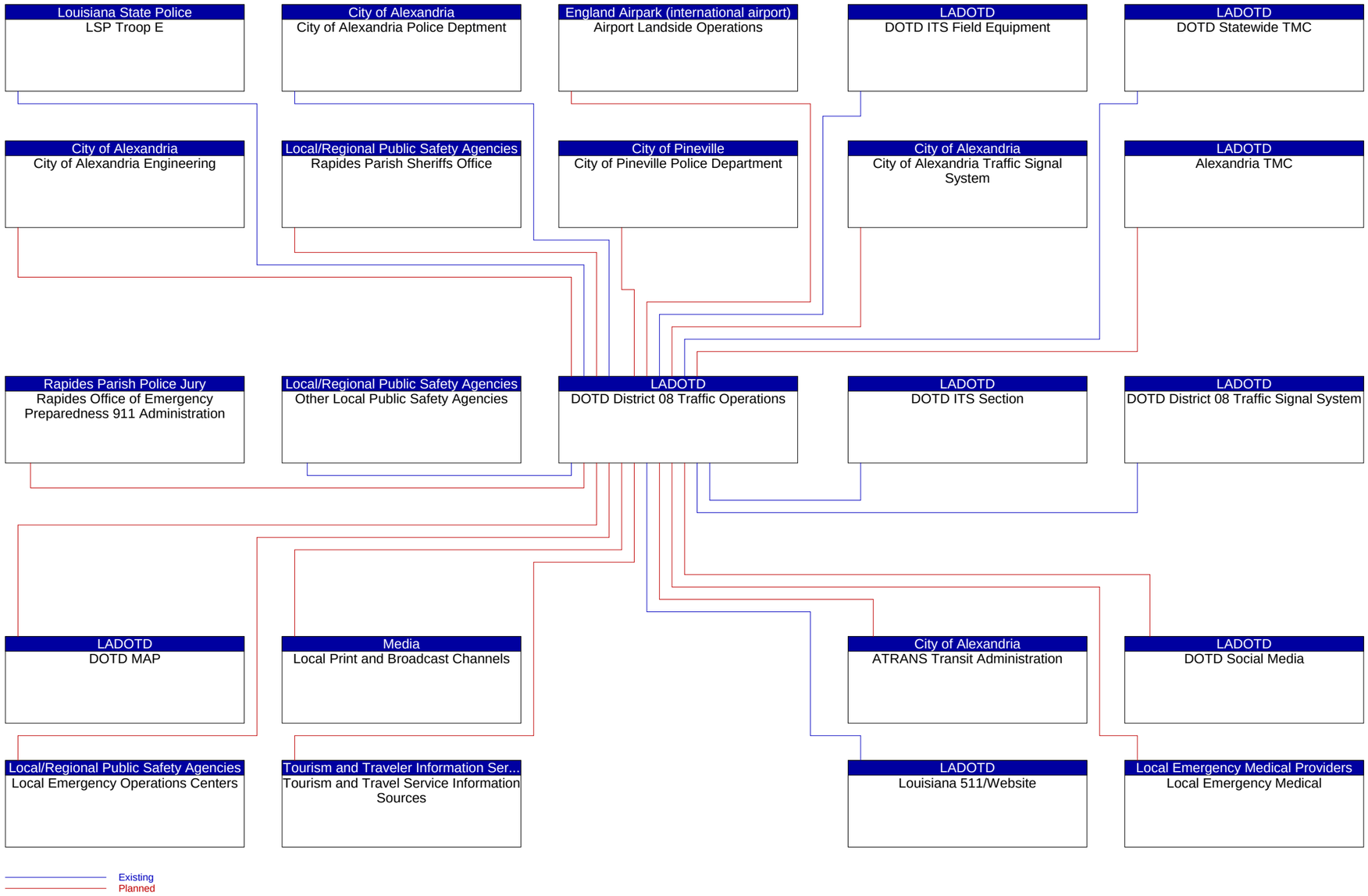

Figure 12: DOTD District 08 Traffic Operations Interconnect Context Diagram

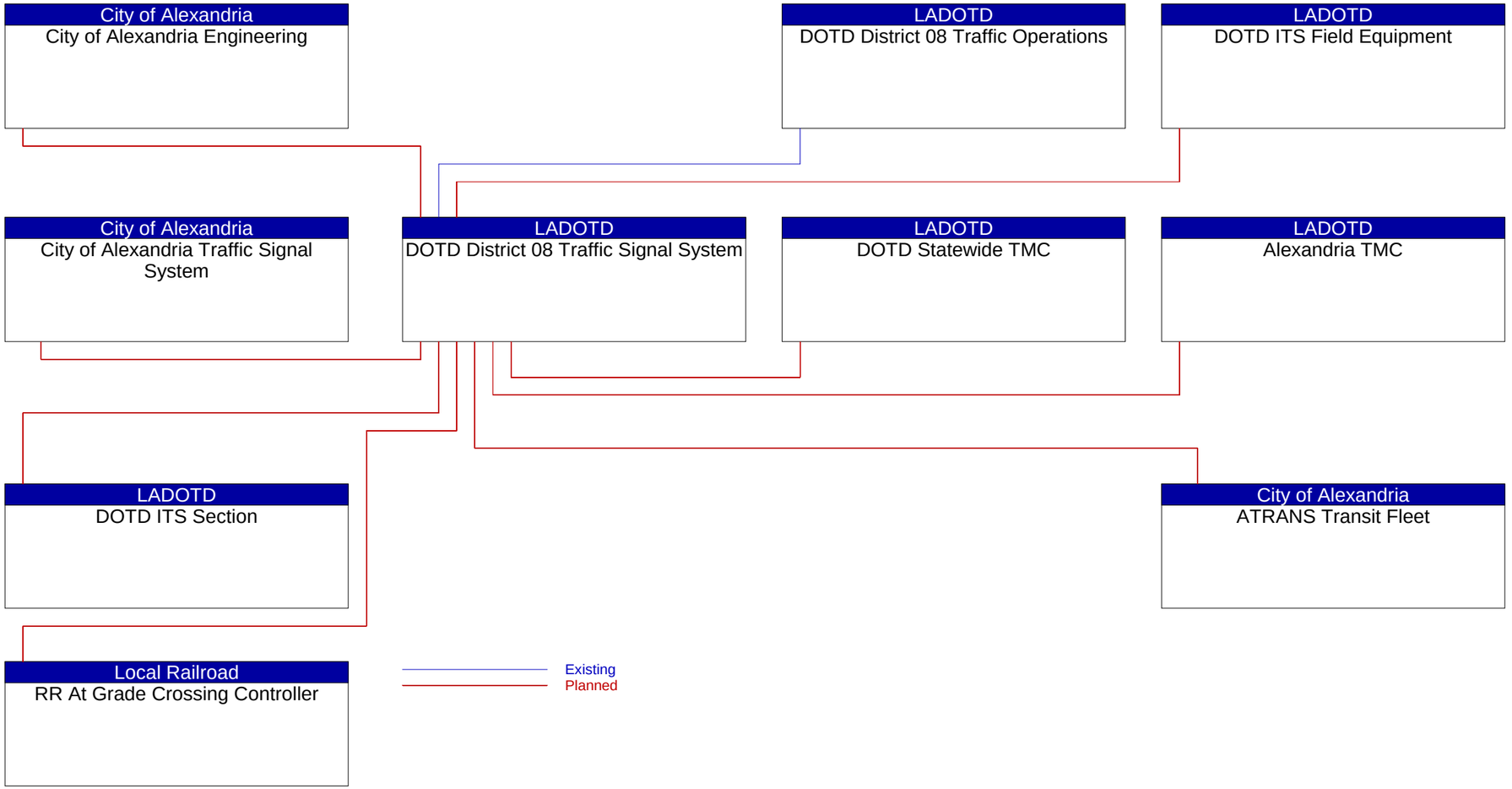

Figure 13: DOTD District 08 Traffic Signal System Interconnect Context Diagram

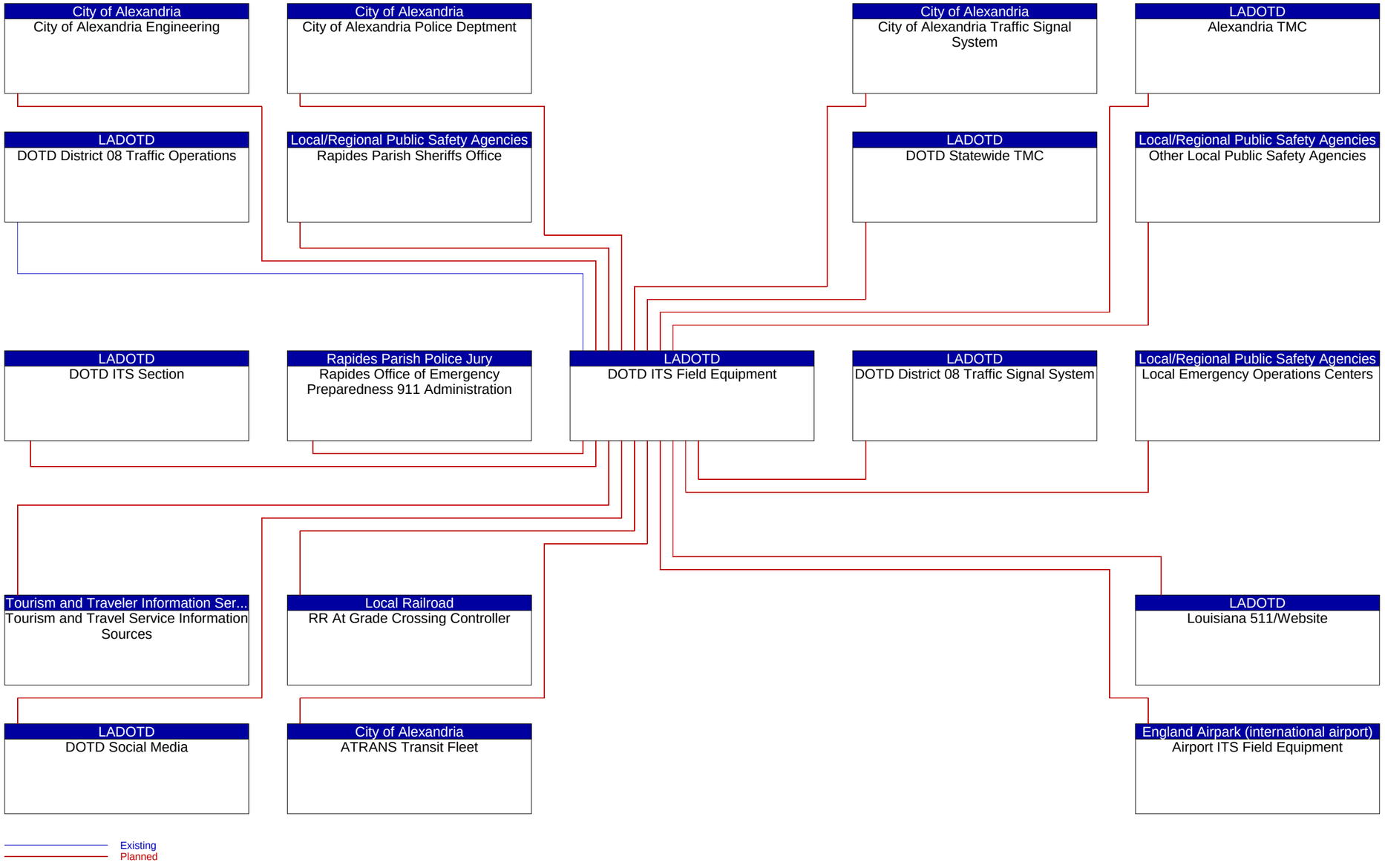

Figure 14: DOTD ITS Field Equipment Interconnect Context Diagram

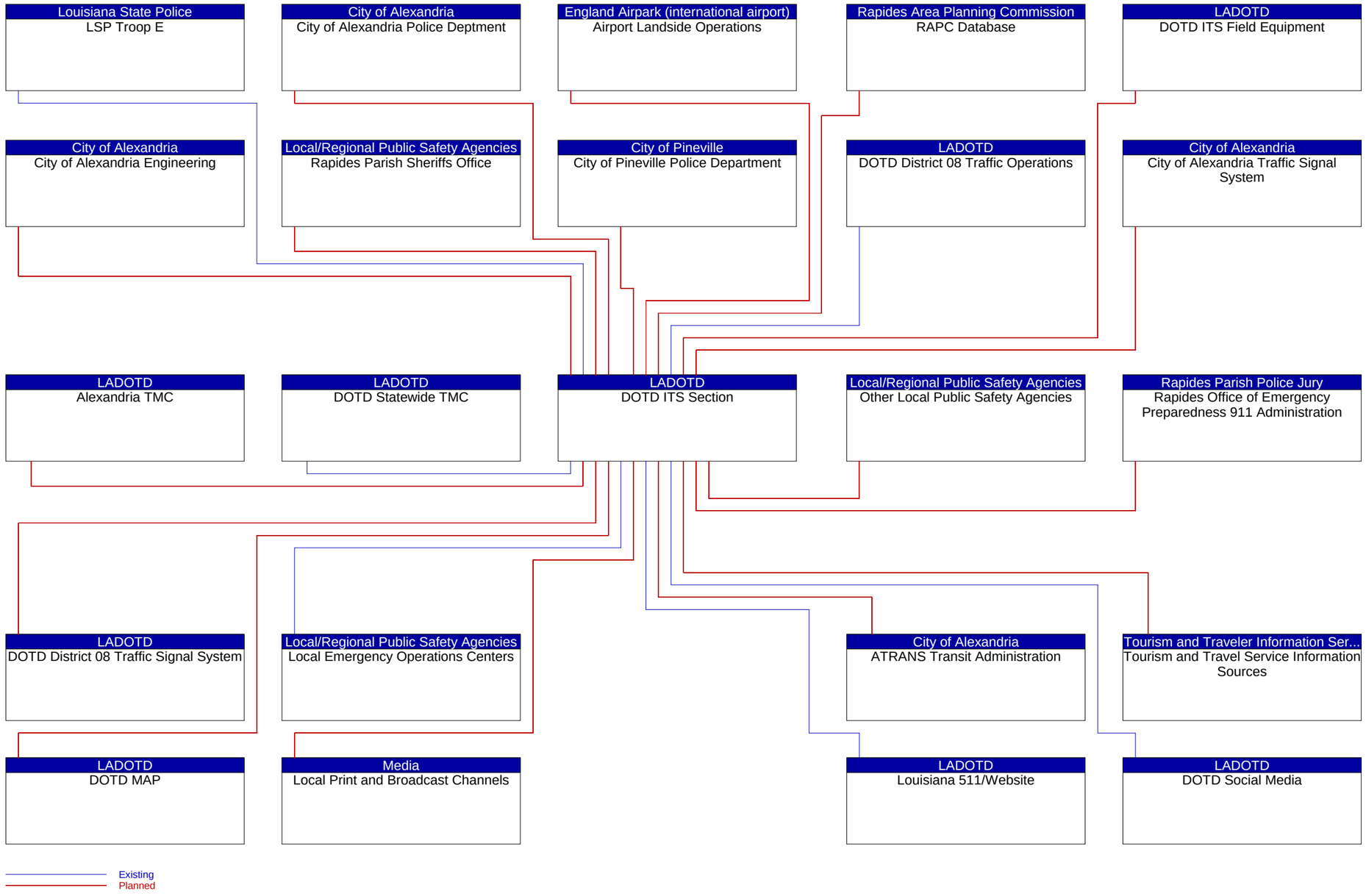

Figure 15: DOTD ITS Section Interconnect Context Diagram

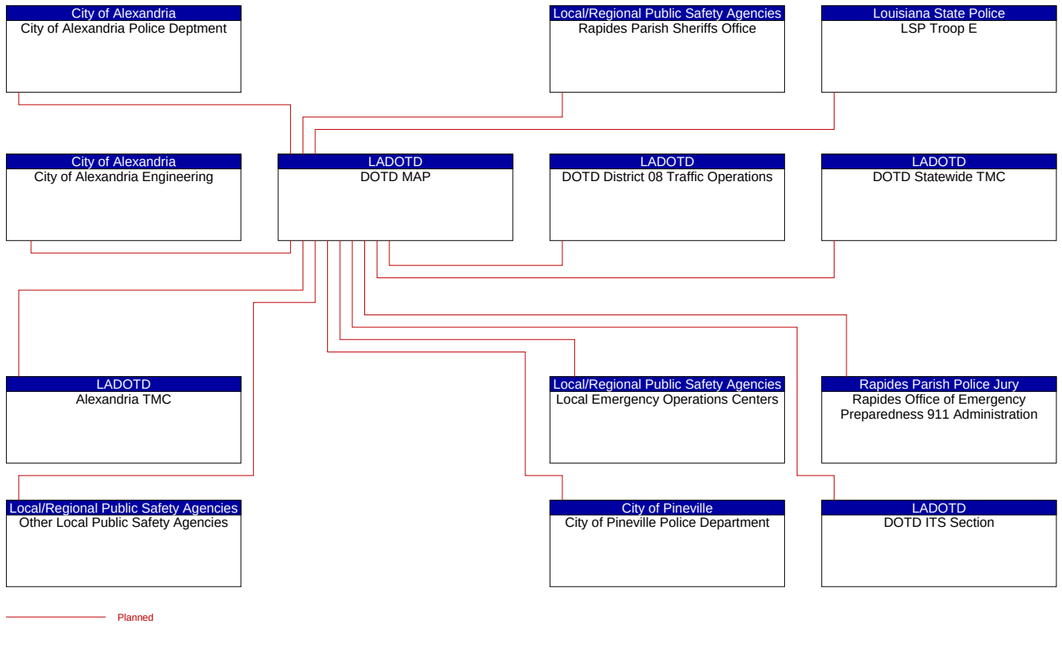

Figure 16: DOTD MAP Interconnect Context Diagram

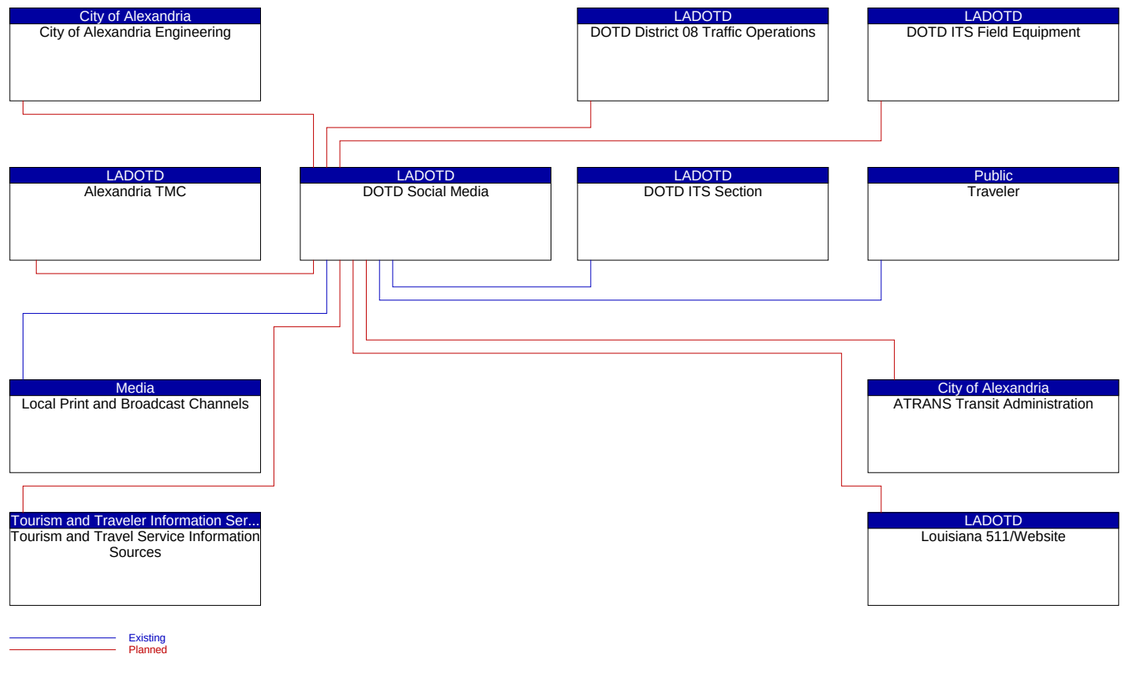

Figure 17: DOTD Social Media Interconnect Context Diagram

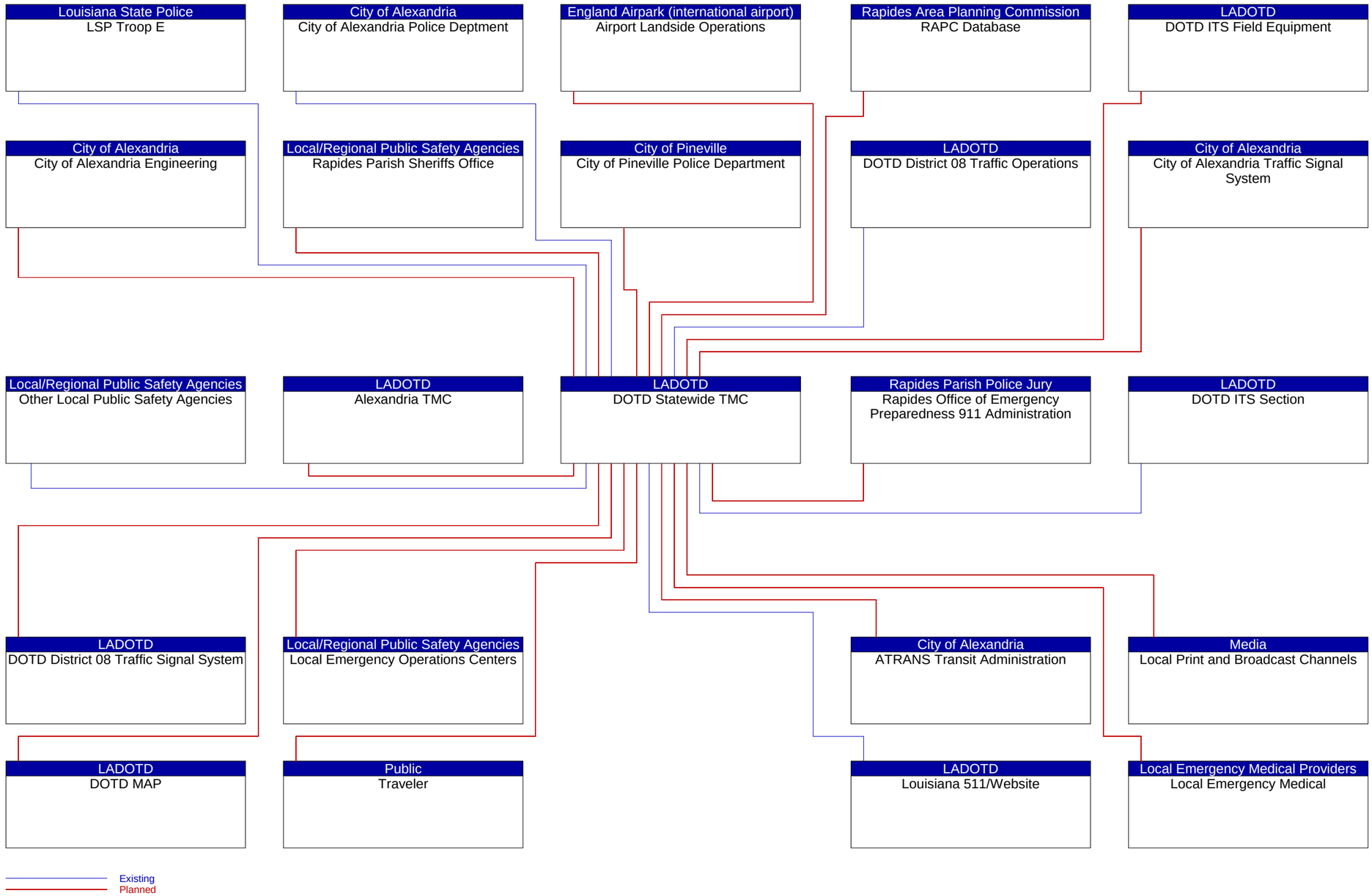

Figure 18: DOTD Statewide TMC Interconnect Context Diagram

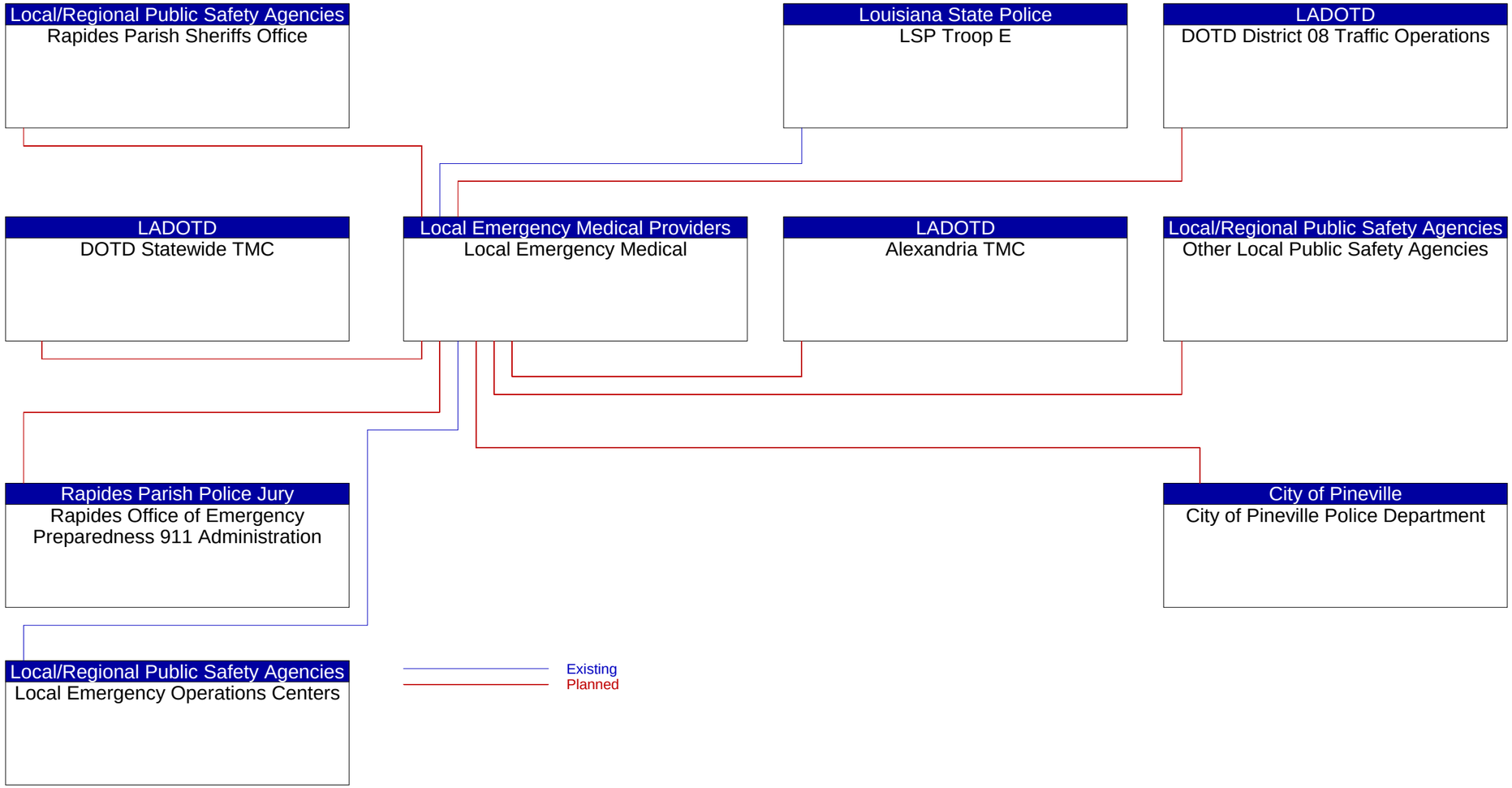

Figure 19: Local Emergency Medical Interconnect Context Diagram

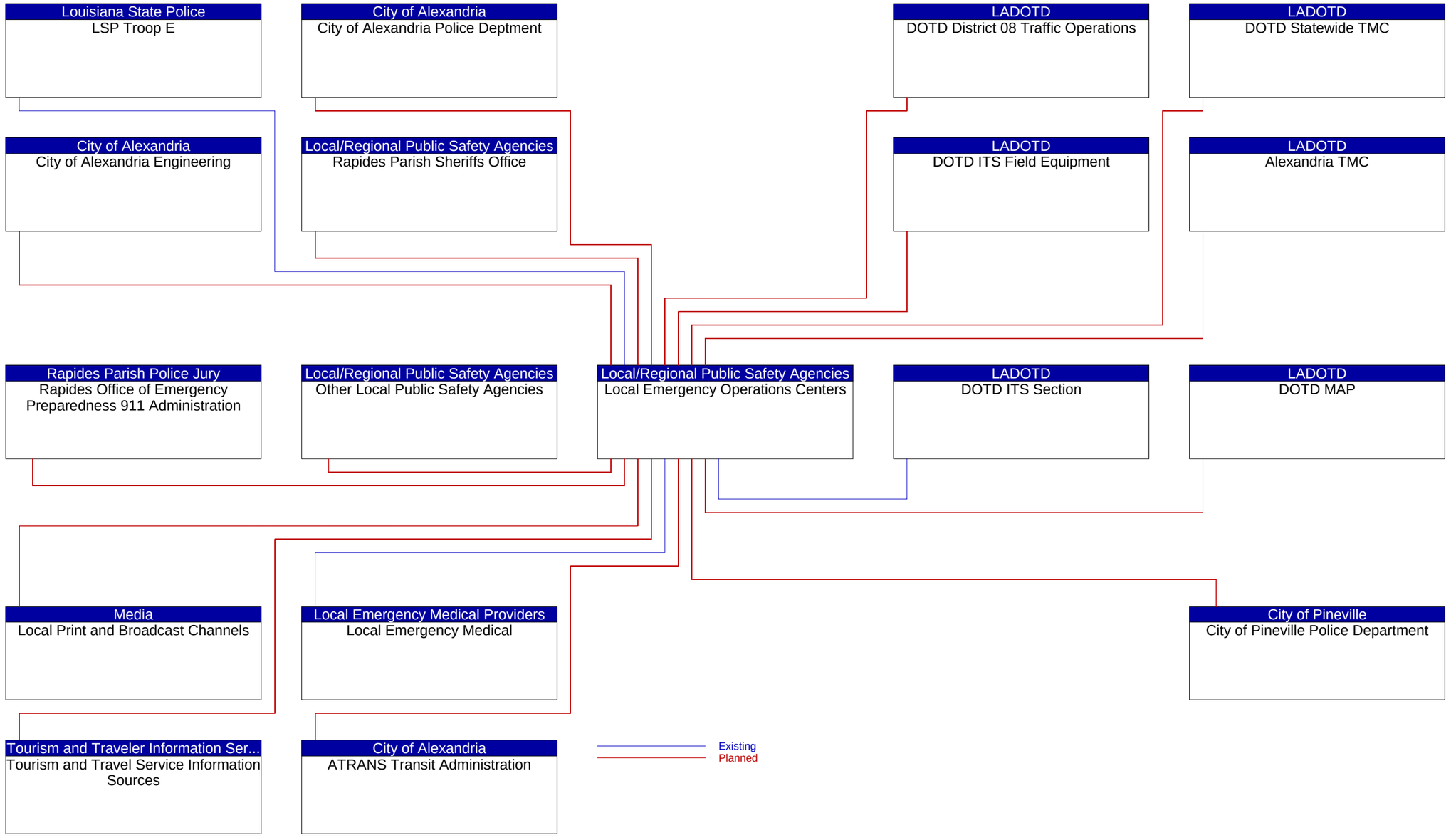

Figure 20: Local Emergency Operations Centers Interconnect Context Diagram

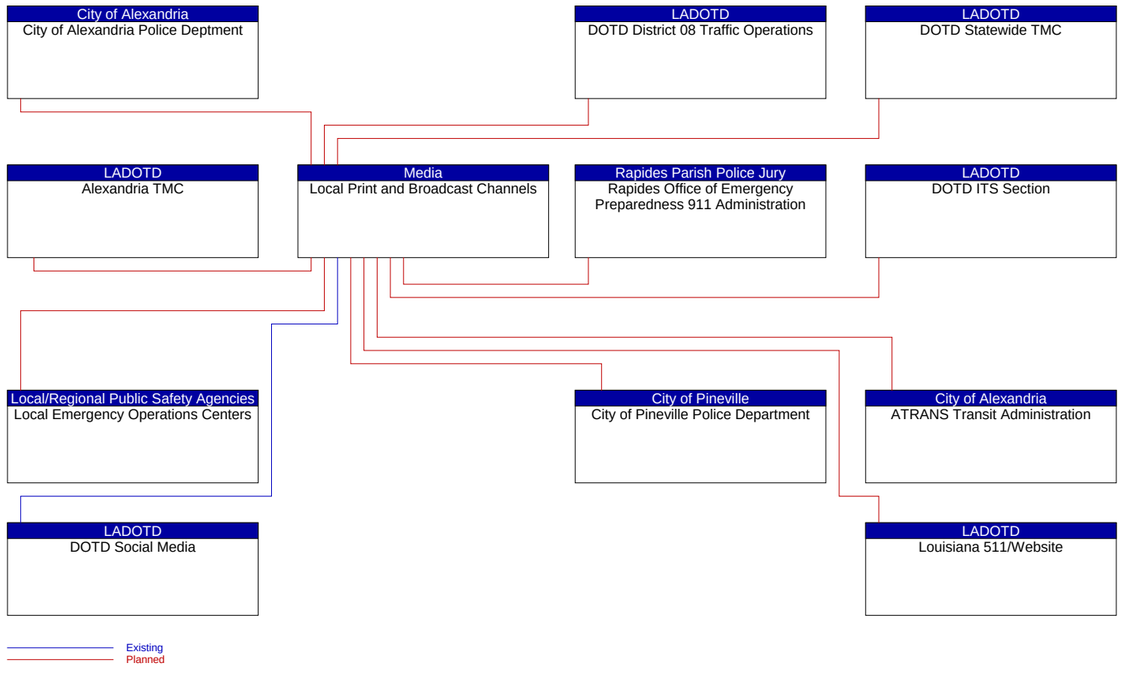

Figure 21: Local Print and Broadcast Channels Interconnect Context Diagram

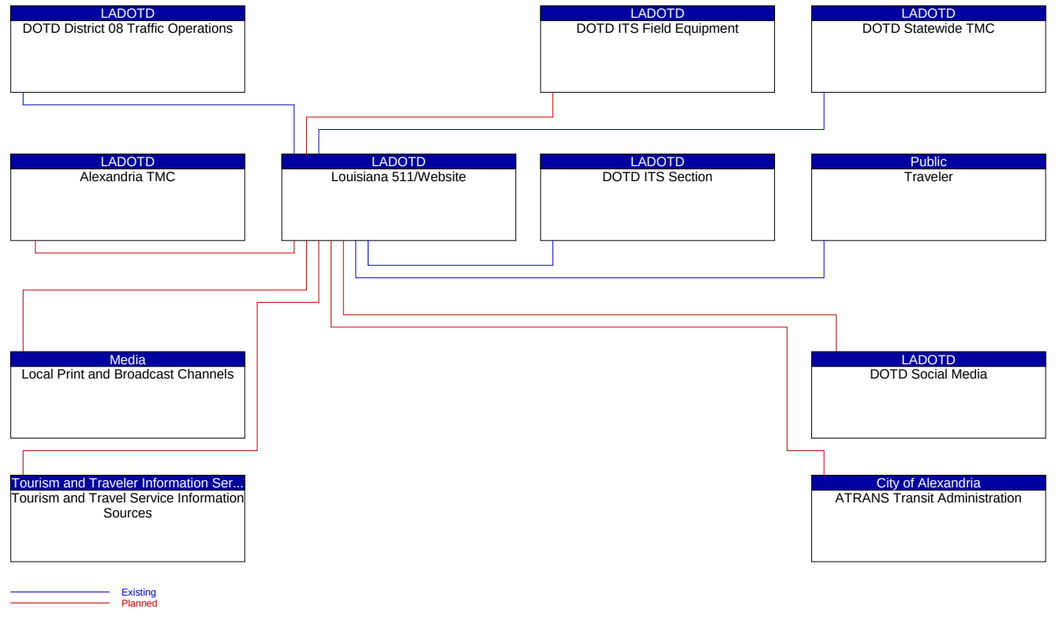

Figure 22: Louisiana 511 Website Interconnect Context Diagram

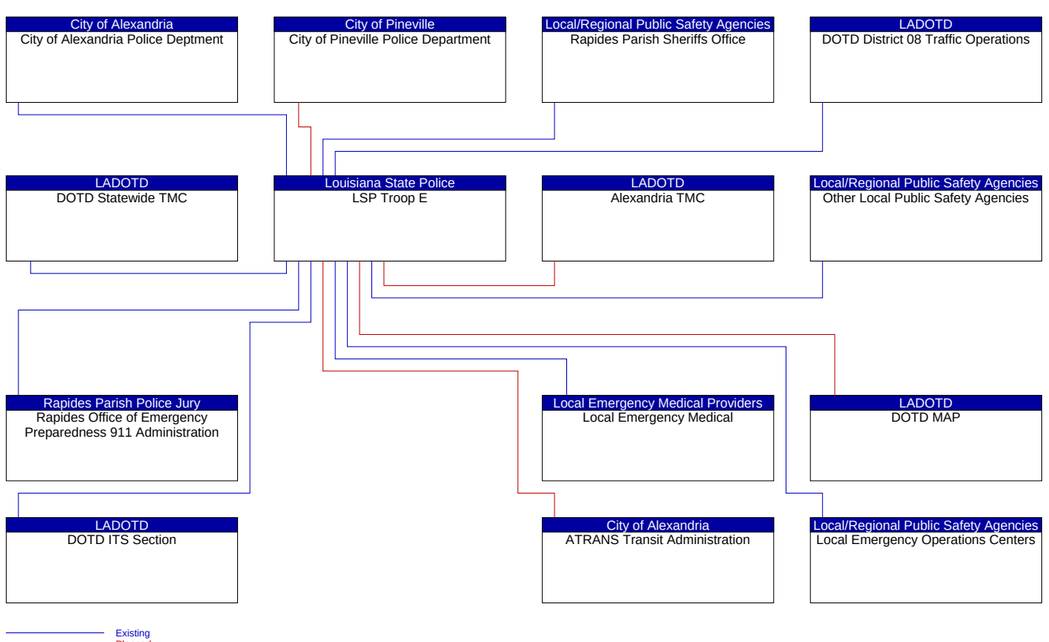

Figure 23: LSP Troop E Interconnect Context Diagram

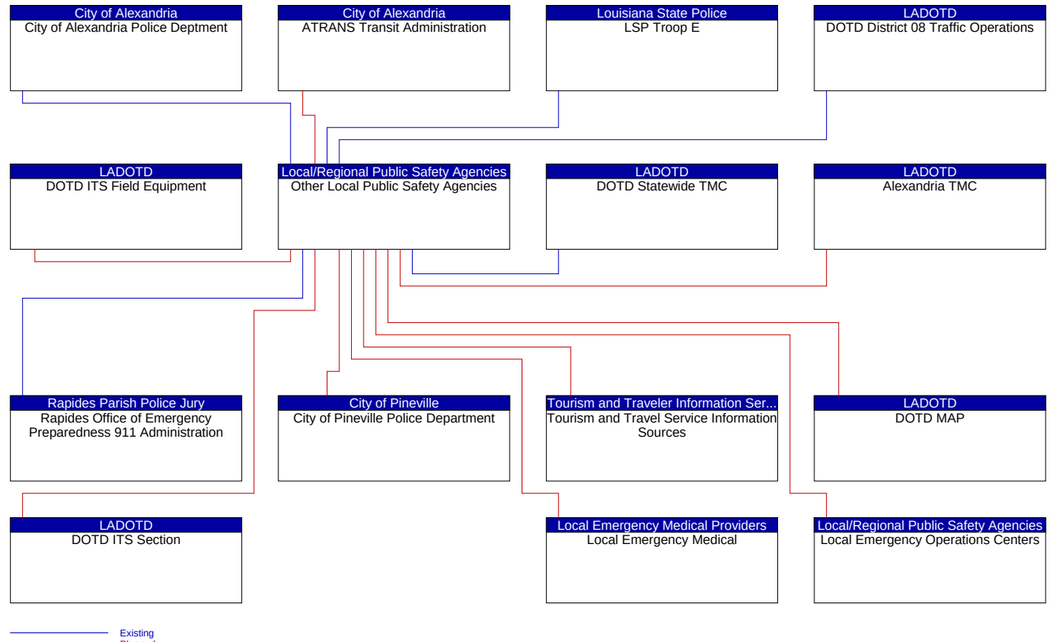

Figure 24: Other Local Public Safety Agencies Interconnect Context Diagram

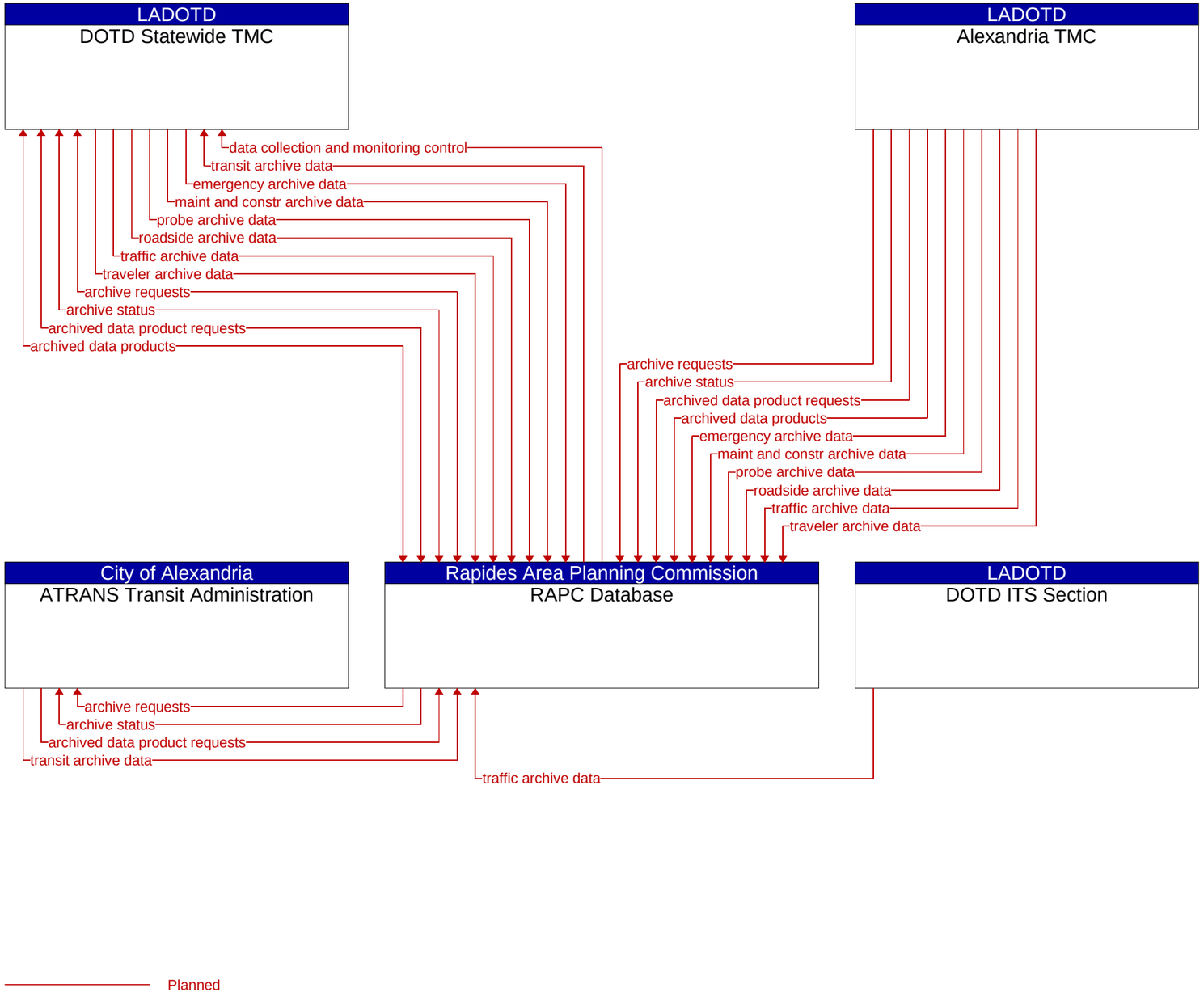

Figure 25: RAPC Database Flow Context Diagram

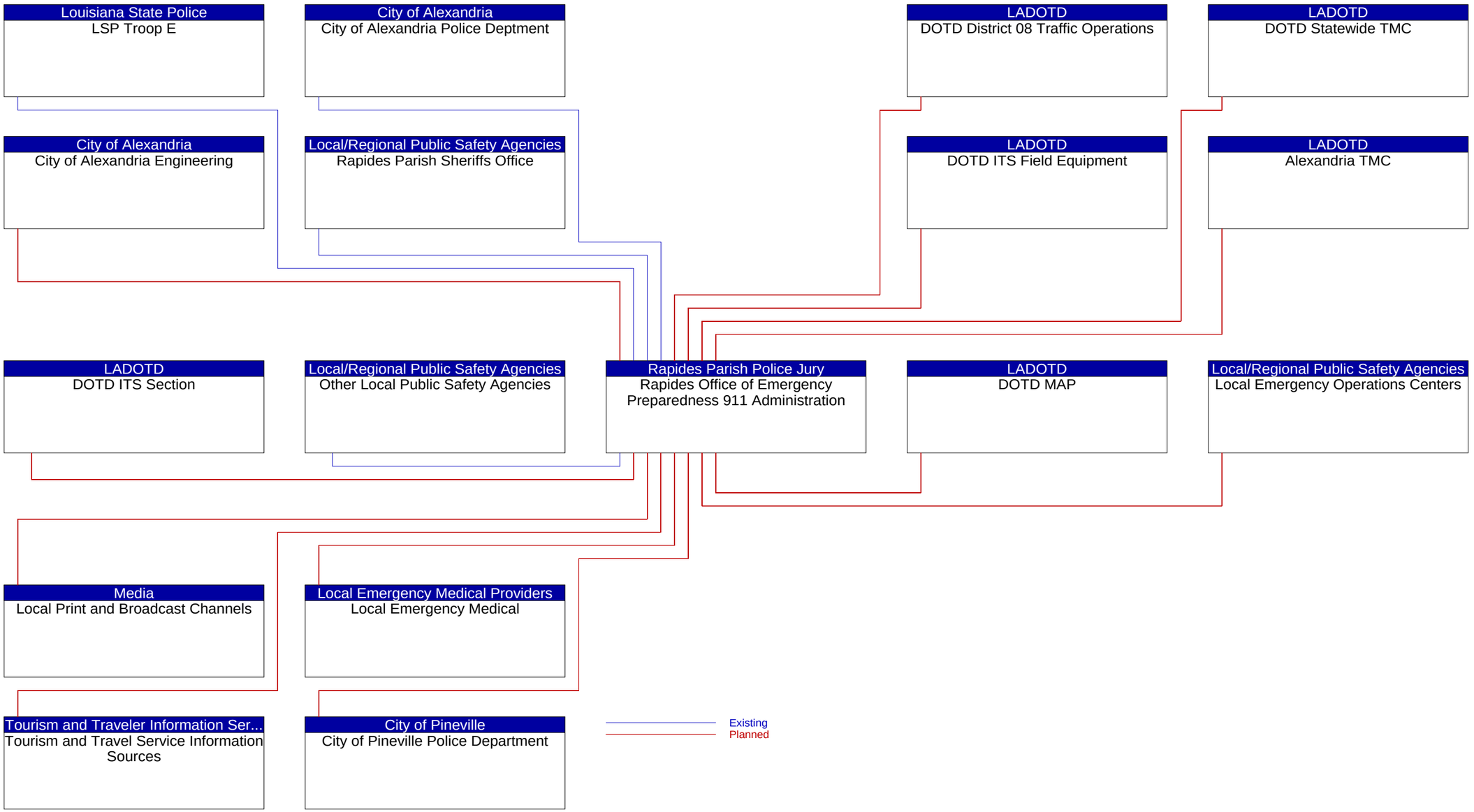

Figure 26: Rapides Office of Emergency Preparedness 911 Administration Interconnect Context Diagram

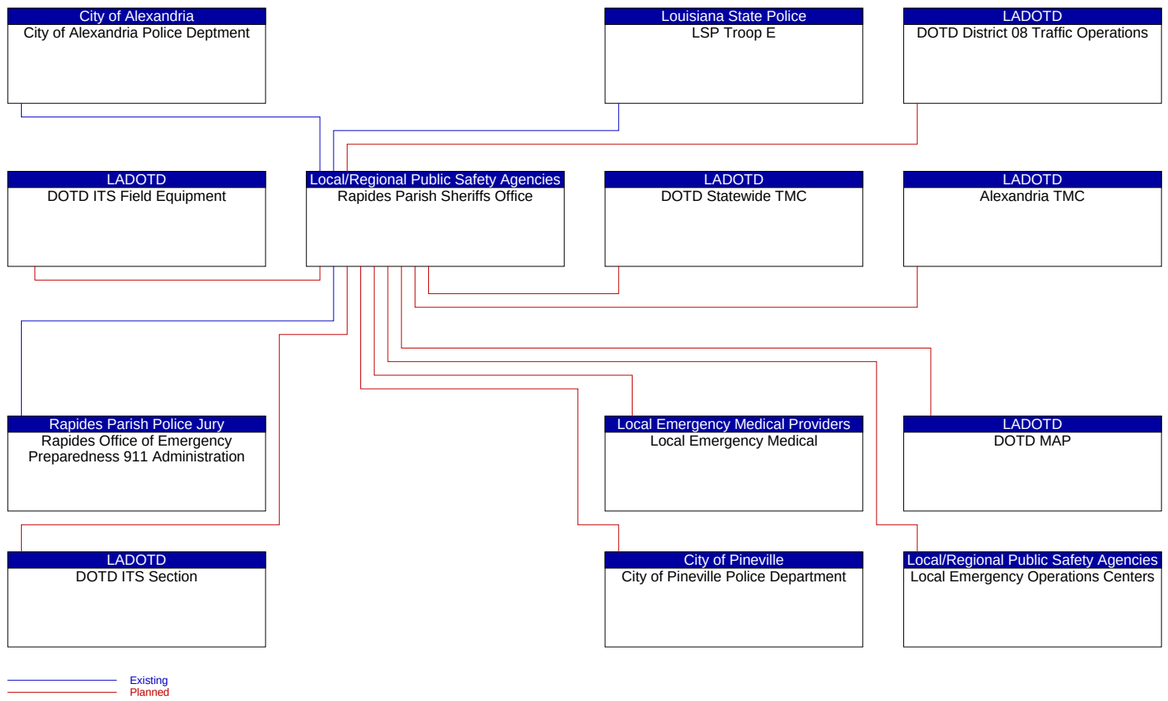

Figure 27: Rapides Parish Sheriff's Office Interconnect Context Diagram

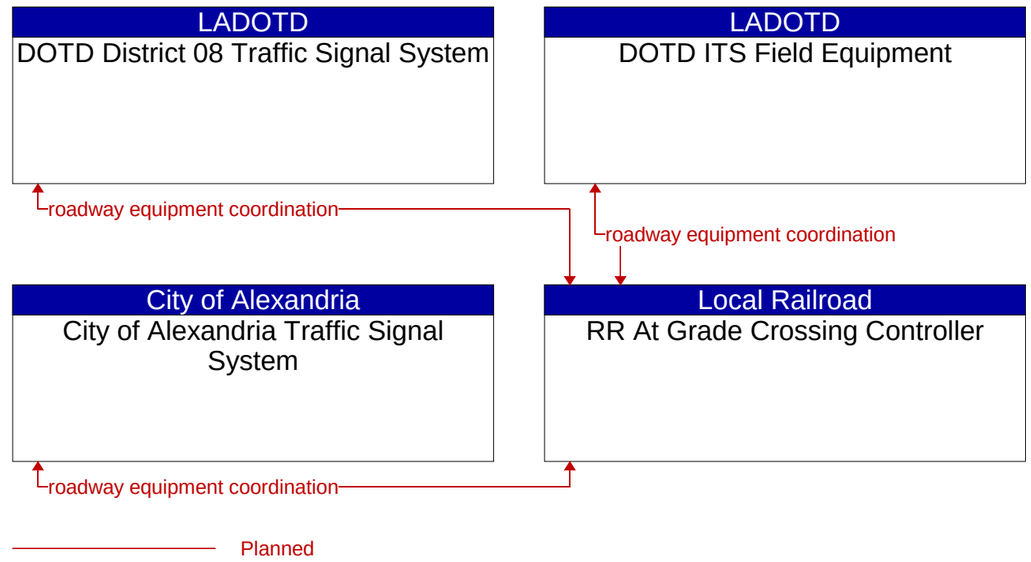

Figure 28: Rail Road At Grade Crossing Controller Flow Context Diagram

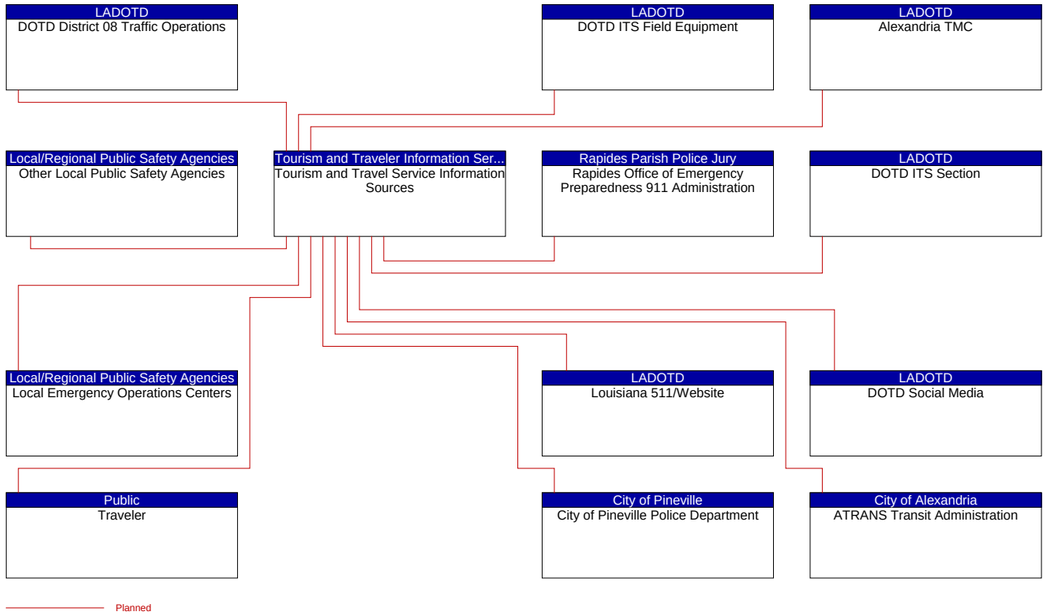

Figure 29: Tourism and Travel Service Information Sources Interconnect Context Diagram

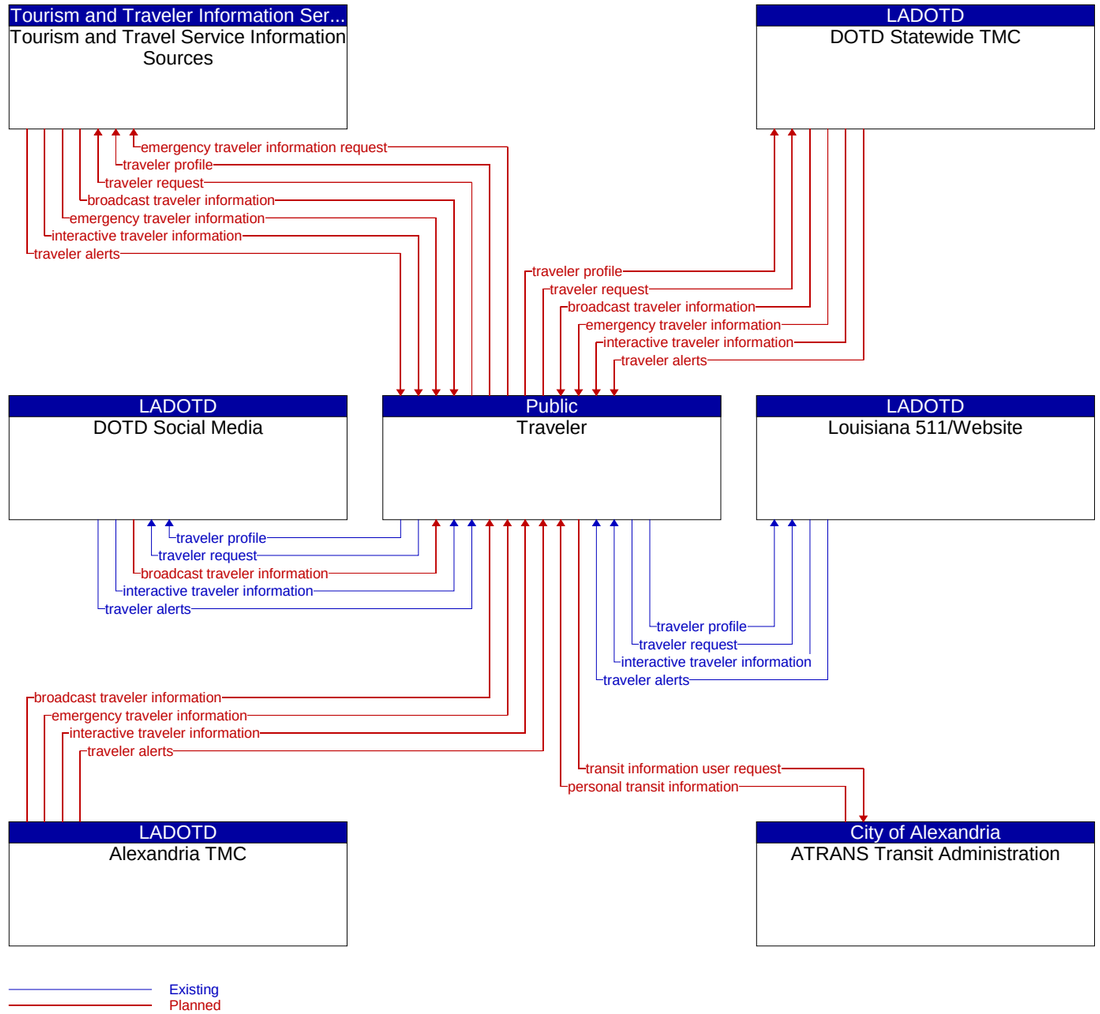

Figure 30: Traveler Flow Context Diagram

APPENDIX - C. ITS Deployment Plan Details

Figure 31: Alexandria ITS Deployment Detailed Schematics